CONTRIBUTIONS FROM THE UNIVERSITY
OF MICHIGAN HERBARIUM, NO. 3

REVISION OF THE AMERICAN CELASTRACEAE I. WIMMERIA, MICROTROPIS, AND ZINOWIEWIA

BY

CYRUS LONGWORTH LUNDELL

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REVISION OF THE AMERICAN CELASTRACEAE I. WIMMERIA, MICROTROPIS, AND ZINOWIEWIA

FEW families of phanerogams have received as little attention by American systematists as have the Celastraceae. The paucity of herbarium material, especially from tropical regions, the difficulty of classification because of the necessity for use of microscopical characteristics, the inadequate delimitations of genera, combined with the scarcity in the New World of species of economic importance, may account for this neglect. Further, the wide distribution of most genera and the localization of species have discouraged field studies.

Of the three genera included in this initial paper, *Wimmeria* alone has been represented sufficiently by collections to show subgeneric and specific relationships. Three-fourths of the species of *Microtropis* and *Zinowiewia* are known from one or two collections only. It is hoped that collectors' interest in the family will be renewed so that material can be accumulated to justify later a comprehensive monograph.

In the list of citations of herbarium specimens, the following abbreviations of the names of herbaria are employed:

A—Arnold Arboretum, Jamaica Plain, Mass.
D—Dudley Herbarium, Stanford University, Calif.
F—Field Museum of Natural History, Chicago, Ill.
G—Gray Herbarium, Harvard University, Cambridge, Mass.
K—Royal Botanic Gardens, Kew, Surrey, England
M—University of Michigan, Ann Arbor, Mich.
Mo—Missouri Botanical Garden, St. Louis, Mo.
NY—New York Botanical Garden, New York, N. Y.
P—Academy of Natural Sciences of Philadelphia, Philadelphia, Pa.
U—Botanisch Museum, Utrecht, Netherlands
US—United States National Herbarium, Washington, D.C.

The writer is greatly indebted to the directors and curators of these institutions for their courtesy in making the material available. All of the cited specimens have been annotated with printed labels.

To the Horace H. Rackham School of Graduate Studies and the Faculty Research Fund of the University of Michigan and the Carnegie Institution of Washington, acknowledgment is

made for support of field studies in Mexico and Central America which have added important data on critical species of *Wimmeria* and *Zinowiewia*. Acknowledgment is also made to the Horace H. Rackham School of Graduate Studies for the grant which made this publication possible.

A REVISION OF THE GENUS WIMMERIA

WIMMERIA Schl. & Cham., *Linnaea*, 6: 427. 1831.

Type species.—*Wimmeria concolor* Schl. & Cham.

Essential characteristics.—Trees and shrubs of tropical America, glabrous or pubescent; branchlets usually slender, sometimes reduced to thick leafy spurs. Leaves alternate, serrulate, pinnately veined, minutely stipulate, petiolate or subsessile. Inflorescence cymose, axillary, dichasially branched, pedunculate, sometimes reduced to 1 flower. Bracts usually small, sometimes foliaceous; bractlets small. Flowers perfect, punctate, pedicellate. Calyx small, deeply 5-lobed, rarely 4-lobed, the lobes subequal to strongly unequal, imbricate. Corolla contorted, rarely imbricate, petals 5, rarely 4, alternate with calyx lobes, patent, the overlapped margin prolonged laterally at apex, usually erose, rarely fringed. Stamens 5, rarely 4, inserted on margin of disk, alternate with petals; filaments filiform or filiform-subulate; anthers versatile, minutely rufous-verrucose, 2-celled, longitudinally dehiscent, ovoid or broadly ellipsoid, usually notched at apex and base, rarely prolonged at apex, sometimes minutely apiculate. Disk large, thick, flat or convex, confluent with base of ovary, conspicuously and coarsely punctate, usually rugose. Ovary narrowly 3- (rarely 2- or 4-) angled or winged, base slightly submerged in disk, usually 3-celled, sometimes 2-celled, very rarely 4-celled, ovules 4 to 9 in each cell, borne on the axillary placenta in 2 rows. Style usually terete, sometimes slightly 3-angled, short and thick or slender and elongated, rarely equaling the ovary in length. Stigma usually 3-lobed, sometimes 2- or 4-lobed, often subcapitate. Fruits 3- (rarely 2- or 4-) winged, ovate, oblong, broadly elliptic, or depressed-orbicular, notched at apex and base, crowned at apex by the persistent stigma and style, indehiscent; wings wide, membranous (in all species seen),

with numerous fine, close, nearly parallel veins almost horizontal at center; 1- (rarely 2-) seeded, the seeds exarillate, erect, linear or linear-lanceolate, terete or subtriquetrous, dark red, finely verrucose; endosperm abundant; embryo large, straight; cotyledons 2, very rarely 3, usually flat, equal or nearly so, linear-lanceolate; radicle short.

W. Bartlettii, apparently the only large tree in the genus, reaches a height of 27 m. and a diameter of 60 cm. in the quasi-rain-forest at the base of the Yucatán Peninsula. *W. cyclocarpa*, *W. obtusifolia*, and *W. concolor* usually are trees, the first and second attaining a height of 10 m. and 15 m., respectively. All four of these grow in wet forest or forest transitional between wet forest and xerophytic. The other Mexican and Central American members of the genus are predominantly shrubby. *W. pubescens*, *W. microphylla*, and *W. confusa* exhibit decided xerophytic characteristics in their reduced leaves, pubescence, and wiry or spur-like branchlets.

The leaves are quite diverse throughout the genus, even in a single species as evidenced by *W. confusa*. In *W. microphylla* the great reduction of the internodes on the leafy spurs gives them a fascicled appearance. The differences in leaf form might justify the recognition of several varieties, notably in *W. confusa* and *W. concolor*, but the difficulty of separating these varieties, because of all degrees of intergradation even in a single collection (see *Palmer 1598*), has discouraged the writer from naming them. In *W. confusa* spatulate leaves predominate in its northern range, ovate leaves in its southern range. The leaves of *W. concolor* are considerably smaller in the northern collections than in the southern collections. Venation is quite variable in some species, such as *W. confusa* and *W. concolor*, ranging from prominulous to obsolete; in others it is prominent and of specific diagnostic value. The type of serratures is nearly uniform for most species. All have leaves slightly paler beneath. With the exception of *W. pubescens* and *W. microphylla*, in which the leaves are usually subsessile, the species have well developed and slender petioles.

The cymes, dichasially branched, reach their greatest development in *W. Bartlettii*, where they often branch as much as 4 times.

In *W. confusa* and *W. microphylla* the reduction of the cyme to a single flower is not unusual. The pedicels, slender in all species, are jointed at or near the base.

The flowers, similar throughout the genus, vary significantly in minor characteristics. All parts apparently are punctate, sometimes decidedly rufous-punctate. The small calyx is thick, with broad depressed imbricate lobes, usually strongly unequal. The contorted corolla, one of the primary differentiating characteristics of the genus *Wimmeria*, is unusual in the family. The prolongation of the overlapped margin varies according to species, the development being greatest in the subgenus Euwimmeria.

The differences in the fruits make possible the establishment of two subgenera: Euwimmeria with fruits longer than broad, and ecristate endocarp, the septa undeveloped; and Wimmeriella with fruits wider than long, and 3-cristate endocarp, the septa rudimentary, partially developed.

The genus *Wimmeria*,[1] with two species, *W. concolor* and *W. discolor*, was established by Schlechtendal and Chamisso (*Linnaea*, 6: 427. 1831). A third species, *W. confusa*, was added by Hemsley (*Diag. Pl. Mex.*, p. 6. 1878). In the same year Radlkofer published a revision of the genus, describing *W. pubescens*, *W. pallida*, *W. persicifolia*, and transferring *Dodonaea* (?) *serrulata* DC. to *Wimmeria* (*Sitzungsb. math. phys. Akad. Wiss. München*, 8: 378–81. 1878). *W. pallida* was based on *Hartweg 41*, the type of *W. confusa* Hemsl. Although Radlkofer's species apparently was named earlier, *W. confusa* is the accepted name because of priority of publication. In his revision Radlkofer recognized the fundamental differences in the fruits, establishing two sections; the same division is upheld in the present revision.

The next species described was *W. cyclocarpa* Radlk. (*Bot. Gaz.*, 18: 199. 1893). In 1897 Rose published a synopsis of the genus, this being largely a translation of Radlkofer's revision (*Contrib. U. S. Nat. Herb.*, 5: 130. 1897). Doubtless because of lack of authentic material for comparison, Rose misinterpreted *W. pubescens* and *W. pallida*. Radlkofer recognized as distinct the

[1] "Nomen imposuimus in honorem Fr. Wimmer operis eximii 'Flora Silesiaca' cum Grabowskio editoris."

Pringle collection from Puebla, referred by Rose to *W. pubescens*, and named the plant *W. microphylla* (*Bot. Centralbl.*, 15: 359. 1903). Subsequently, Rose added *W. lanceolata* and *W. guatemalensis*, the latter species not distinguishable from *W. pubescens* (*Contrib. U. S. Nat. Herb.*, 12: 283. 1909).

Standley was the first to relegate *W. discolor* to synonymy (*Contrib. U. S. Nat. Herb.*, 23: 677. 1923). His interpretation of the Mexican species conformed otherwise to that of Rose, the name *W. pallida* Radlk. being retained, as untenably proposed by Rose. No other species was added until Standley published *W. obtusifolia* (*Field Mus. Bot.*, 8: 20. 1930). Two additional ones, *W. Bartlettii* and *W. acapulcensis*, described by Lundell (*Bull. Torrey Bot. Club.*, 65: 463–76. 1938), bring the total number to 10 recognized species in Mexico and Central America, and 1 of doubtful status in South America.

The genus *Wimmeria*, excepting the doubtful *W. serrulata* which is presumably South American, ranges through central Mexico south to Salvador. In the subgenus Euwimmeria, consisting of 2 species, the first, *W. concolor*, is restricted to eastern Mexico, the states of Vera Cruz, San Luis Potosí, and Tamaulipas and the second, *W. Bartlettii*, occurs in British Honduras and adjacent Guatemala.

In the subgenus Wimmeriella, the 4 species of western Mexico, referred to the section Leiocarpae, form a natural alliance. Of these *W. confusa* has the widest range, extending from Oaxaca north into Sonora and Chihuahua and eastward into Zacatecas. *W. persicifolia* extends through Oaxaca northward into Puebla, Morelos, and the state of Mexico. *W. lanceolata* and *W. acapulcensis* are known only from Guerrero. The section Trichocarpae is another natural alliance of 4 species from southeastern Mexico and northern Central America. *W. microphylla* is restricted to Puebla and adjacent Oaxaca. *W. pubescens* doubtless has its center of distribution in central Vera Cruz, being known elsewhere from a single Guatemalan collection. The third species, *W. obtusifolia*, is known only from Yucatán, and the fourth, *W. cyclocarpa*, is a native of the highlands of Guatemala and Salvador.

In the preparation of this revision, types or authentic isotypes

have been studied of all species excepting *W. concolor* Schl. & Cham. and *W. serrulata* (DC.) Radlk.

I. Trees, rarely shrubby, entirely glabrous; fruits longer than wide, ovate, oblong, or broadly elliptic; endocarp ecristate, the septa undeveloped .....Subgen. *Euwimmeria*[2]
Overlapped margin of petals erose; fruits usually 2 to 2.5 cm. long, rarely 3 cm. long, 1.8 to 2.5 cm. wide; eastern Mexico.....
.....1. *W. concolor*
Overlapped margin of petals fringed, the fimbriae as much as 1.3 mm. long; fruits 3.5 to 5.2 cm. long, 3 to 4 cm. wide; Guatemala, British Honduras.....2. *W. Bartlettii*
II. Usually shrubs, sometimes trees, pubescent or at least puberulent; fruits wider than long, depressed-orbicular; endocarp 3-cristate, the septa rudimentary, partially developed.....Subgen. *Wimmeriella*[3]
A. Leaf blades entirely glabrous, or if puberulent, then entirely glabrous beneath; fruits glabrous.....Sec. *Leiocarpae*
a. Leaves attenuate-acuminate at apex; pedicels glabrous
Margin of leaves serrulate with uniform teeth; venation prominent, the veins and veinlets raised; fruits broadest below middle; Oaxaca, Puebla, Morelos, state of Mexico.....
.....3. *W. persicifolia*
Margin of leaves serrulate with coarser, subequal teeth; venation faint, the veins scarcely raised, veinlets obscure; fruits broadest above middle; Guerrero.....4. *W. lanceolata*
b. Leaves obtuse or rounded at apex; pedicels puberulent, at least at base
Leaves 4.5 to 7 cm. long, 2 to 3.8 cm. wide; petioles 5 to 15 mm. long; Guerrero.....5. *W. acapulcensis*
Leaves usually 1.8 to 3.5 cm. long, 4 to 11 mm. wide; petioles 1.5 to 4 mm. long; western Mexico.....6. *W. confusa*
B. Leaf blades pilose or puberulent on both surfaces; fruits sparsely puberulent (not known in *W. obtusifolia*)....Sec. *Trichocarpae*
c. Leaves small, 1 to 3 cm. long, 4 to 17 mm. wide, subsessile or with petioles up to 3 mm. long
Leaf blades elliptic, oblong, or narrowly obovate; cymes usually 3-flowered, sometimes 1-flowered; pedicels short pilose; margin of calyx lobes erose-denticulate; anthers usually prolonged at apex; Puebla, Oaxaca....7. *W. microphylla*
Leaf blades cuneate-obovate or oblanceolate-oblong; cymes usually 3- to 7-flowered, sometimes 14-flowered; pedicels puberulent; margin of calyx lobes entire; anthers never

[2] **Euwimmeria** subgen. nov.—Arborea raro fruticosa, glaberrima. Fructus longiores quam latiores, ovoidei, oblongi vel late ellipsoidei, endocarpio ecristato, septis deinde nullis. Species typica *W. concolor* Schl. & Cham.

[3] **Wimmeriella** subgen. nov.—Plerumque fruticosa interdum arbuscula, pubescens vel puberula. Fructus latiores quam longiores depresse orbiculares, endocarpio 3-cristato, septis evidentibus subabortivis. Species typica *W. acapulcensis* Lundell.

prolonged at apex; Vera Cruz, Guatemala.....
.....8. *W. pubescens*

d. Leaves 3 to 7.5 cm. long, 1.3 to 4.4 cm. wide; petioles 3 to 9 mm. long

Leaves usually obtuse at apex, sparsely puberulent on both surfaces; petioles puberulent; cymes puberulent, 3- to 7-flowered; Yucatán.....9. *W. obtusifolia*

Leaves usually acuminate at apex, short pilose on both surfaces; petioles densely pubescent; cymes densely pubescent, 7- to 14-flowered; highlands of Guatemala and Salvador....
.....10. *W. cyclocarpa*

1. WIMMERIA CONCOLOR Schl. & Cham., *Linnaea*, 6: 428. 1831.

Wimmeria discolor Schl. & Cham., *Linnaea*, 6: 428. 1831.

A shrub (Pringle) or small tree (Pringle, Runyon, Purpus), entirely glabrous; branchlets slender, striate. Leaves usually small, petiolate, subchartaceous at first, subcoriaceous with age, slightly discolorous. Stipules subulate, 0.6 mm. long or less. Petioles 3 to 7 mm. long, slender, canaliculate, medial ridge faint. Leaf blades lanceolate or elliptic, usually 4.5 to 6.5 cm. long, sometimes as much as 8 cm. long, usually 1.5 to 2.8 cm. wide, rarely as much as 3.5 cm. wide, the apex usually acuminate, the acumen acute to obtuse, apex sometimes acute, acutish, or obtuse, base acuminate to acutish, costa faint above, prominent beneath, main lateral veins 6 to 9, prominulous to obsolete, arcuately ascending, margin serrulate to subentire, serratures usually minutely subulate-tipped. Cymes 2.3 cm. long or less, pedunculate, forked 1 or 2 times, open, cymules sometimes reduced to a single flower. Bracts broadly ovate, 0.5 to 1.1 mm. long, acutish. Flowers yellowish or greenish (Runyon). Pedicels slender, sometimes 6 mm. long, usually less. Calyx 5-lobed, the lobes subequal, broadly rounded, minutely apiculate. Petals 5, ovate, or broadly elliptic, 2 to 3.2 mm. long medially, minutely apiculate, the overlapped margin prolonged laterally at apex as much as 1.2 mm., thin, erose. Stamens 5; filaments 2.3 to 3 mm. long; anthers 1 to 1.2 mm. long. Ovary usually 3-angled, 3- rarely 4-celled, base slightly immersed in disk. Style short, subterete. Stigma subcapitate, trifid. Fruits 3- rarely 4-winged, broadly ovate, elliptic-oblong, or broadly elliptic, usually 2 to 2.5 cm. long, sometimes 3 cm. long, 1.8 to 2.5 cm. wide at maturity, deeply cordate at

base, notched at apex; 1- or 2-seeded, the seed straight, linear, up to 1.4 cm. long, apex acutish, the testa finely verrucose, reddish black; endosperm layer thin; cotyledons flat, equal or nearly so, linear-lanceolate, about 11.5 mm. long, obtusish; radicle about 1.5 mm. long, subterete.

Type locality.—Colipa, Vera Cruz, Mexico.

Distribution.—Vera Cruz, eastern San Luis Potosí, and southern Tamaulipas, Mexico.

Specimens examined.—Vera Cruz: "In sylvis apricioribus Papantlae arborescens," *G. Schiede and F. Deppe 1330*, flower buds and young fruits, type collection of *W. discolor* Schl. & Cham. (F-fragment, K, Mo). Puente Nacional, June, 1838, *J. Linden 801*, flowers (K). Papantla, June, 1841, *F. M. Liebmann 4043*, flowers and fruits (C, F, M, NY, US). Papantla, June, 1841, *Liebmann 14886*, flowers and fruits (F). San Sebastian, April, 1841, *Liebmann 4042*, fruits (C, US). Colipa, March, 1841, *Liebmann 108*, flowers (US). Orizaba, *Botteri 877*, fruits (K). Orizaba, *C. Mohr 887*, fruits (US). Misantla, July, 1912, *C. A. Purpus 5960*, fruits (C, F, G, Mo, NY, US). Barranca near Rancho Remudadero, March, 1927, *Purpus 10902*, fruits (F). Arroyo near Rancho Remudadero, a rare tree, April, 1928, *Purpus 11120*, fruits (F). Arroyo near Remudadero, April, 1932, *Purpus 11160B*, fruits (A). San Luis Potosí: en route from San Luis Potosí to Tampico, December, 1878, to February, 1879, *Edward Palmer 1041*, fruits (G). Near "Los Canos," Oct. 15–21, 1902, *Palmer 220*, fruits (C, F, G, NY, US). Tamasopo Cañon, July, 1890, *C. G. Pringle 3521*, flowers and fruits (A, G). Las Canoas, June 25, 1890, *Pringle 3535*, flowers (A, G). Las Canoas, June 19 (flowers), Aug. 7, 1891 (fruits), *Pringle 3706* (A-2, C, F, G, M, Mo, NY, P, US). Tamaulipas: vicinity of Victoria, altitude about 320 m., Feb. 1–April 9, 1907, *Palmer 123*, fruits (A, C, F, G, NY, US). Vicinity of Tampico, altitude about 15 m. Jan. 1–31, 1910, *Palmer 128*, flowers and fruits (F, M, Mo, NY, US). Near Victoria, widespread on side of mountain, altitude 500 m., April 4, 1926, *Robert Runyon 946*, flower buds (US). South of Victoria, widespread on side of mountain, altitude 1000 m., April 7, 1926, *Runyon 994*, flowers (US).

The species is variable in leaf characteristics, but the differences do not appear to be of particular taxonomic significance. All the specimens agree in essential characteristics with type material of *W. discolor* Schl. & Cham. Although no type material of *W. concolor* has been available, I do not hesitate to consider *W. discolor* a synonym. Both species were described from immature or incomplete specimens, and the leaf differences used to separate them are not dependable.

2. Wimmeria Bartlettii Lundell, *Bull. Torrey Bot. Club.*, 65: 467. 1938. (Pl. I, Fig. 2.)

A tree reaching a height of 27 m. and a diameter of 60 cm. (Bartlett, Lundell), with smooth gray bark; entirely glabrous; branchlets green, rather stout, striate. Leaves large, petiolate, coriaceous, slightly discolorous. Stipules subulate, less than 1 mm. long. Petioles 7 to 12 mm. long, subcanaliculate above, with a fine medial ridge. Leaf blades lanceolate, lanceolate-oblong, or elliptic, 6 to 13.5 cm. long, 1.8 to 5.5. cm. wide, acuminate at both ends, costa raised above as a narrow fine ridge extending nearly to apex, prominent beneath, main lateral veins 6 to 9 on each side, arcuately ascending, prominulous to obscure on both surfaces, veinlets usually inconspicuous and obscure, rarely slightly impressed, margin serrulate, the serratures subulate-tipped with appressed nigrescent teeth. Cymes 1.3 to 3.5 cm. long, pedunculate, forked 2 to 4 times. Bracts and bractlets broadly triangular, acutish, 0.35 to 0.8 mm. long. Flowers green (Bartlett). Pedicels slender, 3 to 13 mm. long, jointed at base. Calyx lobed, the lobes imbricate, broadly ovate-triangular, rounded or bluntly obtuse. Corolla contorted, very rarely imbricate; petals 5, broadly ovate, about 3 mm. long medially, the overlapped margin prolonged laterally at apex, thin, conspicuously fringed, the fimbriae as much as 1.3 mm. long. Stamens 5; filaments 2.2 to 3 mm. long; anthers 1 to 1.2 mm. long. Ovary usually 3-angled, 3- rarely 4-celled, base immersed in disk. Style very short, usually triquetrous. Stigma trifid. Fruits crimson (Bartlett) or reddish brown (Schipp), 3- rarely 4-winged, broadly ovate, broadly elliptic or oblong, 3.5 to 5.2 cm. long, 3 to 4 cm. wide at maturity, deeply

cordate at base, shallowly emarginate to deeply notched at apex; 1- or 2-seeded, the seed straight, linear, subterete, up to 1.8 cm. long, the testa finely verrucose, dark red; endosperm abundant; cotyledons flat, equal, linear-lanceolate, about 14 mm. long, apex obtuse; radicle up to 1.8 mm. long, subterete.

Type locality.—In sapodilla and mahogany forest at Uaxactun, Department of Petén, Guatemala.

Distribution.—British Honduras and Guatemala.

Specimens examined.—GUATEMALA: Department of Petén, Uaxactun, in sapodilla and mahogany forest, March 21, 1931, *H. H. Bartlett 12216*, sterile (A, M); April 2, 1931, *Bartlett 12435*, flowers, type (M), type collection (A, Mo, NY, US); April 6, 1931, *Bartlett 12481*, flowers and fruits (A, D, M, NY, US); April 8, 1931, *Bartlett 12536*, flowers (A, M); April 27, 1931, *Bartlett 12773*, fruits (M, NY). La Libertad, in forest on side of limestone hill in Monte Chicbul, *C. L. Lundell 2640*, sterile (M). Department of Izabal, lower Río Dulce, March 2, 1885, *Sereno Watson 43*, fruits (G, K). BRITISH HONDURAS: El Cayo District: Valentin, in advanced, valley forest on limestone, June 27, 1936, *Lundell 6278*, flower buds (M-2). Toledo District: Temash River, on river bank in shade, April 22, 1934, *W. A. Schipp 1296*, fruits (A, F, G, M, Mo, NY).

Vernacular names.—*Quiebra hacha blanco* (*Bartlett 12216*); *Chintoc* (*Bartlett 12435*); *Ixolte ixnuc* (*Bartlett 12481*).

Economic value.—Wood utilized locally for xylophone keys (*Bartlett*).

3. WIMMERIA PERSICIFOLIA Radlk., *Sitzungsb. math. phys. Akad. Wiss. München*, 8: 379. 1878.

A shrub 3 to 5 m. high (Hinton, Pringle); branchlets usually slender, glabrous (Oaxaca collections) or puberulent (Puebla, Morelos, and state of Mexico collections), striate. Leaves chartaceous or subchartaceous, slightly paler beneath. Stipules 0.5 mm. long or less. Petioles 1 to 1.7 cm. long, slender, weak, subterete or slightly canaliculate, with a strong medial ridge above, glabrous or puberulent. Leaf blades lanceolate, ovate-lanceolate, or ovate-elliptic, 5.5 to 10.5 cm. long, 1.8 to 4.5 cm. wide, apex long attenuate-

acuminate, base acuminate to abruptly acute, costa prominent on both surfaces, reticulate-veined, main lateral veins 6 to 8 on each side, prominent above, less conspicuous beneath, arcuately ascending, veinlets usually raised above, fainter beneath, margin minutely callose-serrulate with rather uniform teeth, usually glabrous, sometimes puberulent above along the midrib and veins (*Pringle 6210*). Cymes 3 cm. long or less, usually long-pedunculate, open, forked 1 to 3 times, the branches puberulent or glabrous. Bracts linear, 1.5 to 3 mm. long, serrulate, bractlets triangular with toothed margin, deciduous early. Pedicels slender, glabrous, 4 to 8 mm. long. Calyx 5-lobed, the lobes strongly unequal, the 2 outer lobes rather thick, broadly rounded, about 1.5 mm. wide, usually minutely apiculate, the 3 inner lobes thinner, broadly rounded, truncate, or emarginate, 2 to 3.5 mm. wide. Petals 5, rather thin, 7- to 9-veined, elliptic-oblong, ovate-elliptic, or obovate, rarely suborbicular (*Pringle 6210*), 3 to 4.5 mm. long medially, with the overlapped margin prolonged laterally at apex as much as 0.8 mm., 2.5 to 3.1 mm. wide, sometimes rufous-punctate between the veins, subentire. Stamens 5; filaments usually 3.1 to 3.5 mm. long, sometimes only 2 mm. long (*Pringle 6210*, *Hinton 3151*); anthers 1.2 to 1.4 mm. long, sometimes apiculate. Disk obscurely and minutely puberulent. Ovary narrowly 2- or 3-winged, 2- or 3-celled, base immersed in disk, distinctly pellucid punctate; ovules 5 to 9 in each cell. Style subterete, about 1 mm. long or less. Stigma subcapitate, bifid or trifid. Fruits 2- or 3-winged, broadest below the middle, usually broadly depressed ovate, sometimes suborbicular in outline (immature fruits 1.1 to 1.4 cm. long, 1.2 to 1.8 cm. wide), shallowly notched at apex and base; 1-seeded.

Type locality.—Ejutla, Oaxaca, Mexico.

Distribution.—Oaxaca, Puebla, Morelos, and state of Mexico, Mexico.

Specimens examined.—Oaxaca: Ejutla, October, 1842, *F. M. Liebmann 4044*, immature fruits, type collection (C, F, US-2). Ejutla (?), 1841–43, *Liebmann 112*, photograph (F). Huanhtlilla, Dec. 15, 1895, *Ed. Seler 1566B*, fruits (G). Hacienda de Viguera, altitude 1700 m., Oct. 24, 1897, *C. Conzatti and V. Gonzalez 523*,

flowers (G, US). Hacienda de Guadalupe, altitude 1600 m., Sept. 30, 1906, *C. Conzatti 1571*, flowers and young fruits (F, US). Cuesta de Huanclilla, Distrito de Nochixtlán, altitude 1900 m., Oct. 12, 1921, *Conzatti 4258*, flowers (US). Cerro San Blas, Huanclilla, Distrito de Nochixtlán, altitude 2200 m., Oct. 14, 1921, *Conzatti 4273*, flowers (US). PUEBLA: near Acatlán, Nov. 8, 1910, *Seler 5406*, young fruits (G, US). MORELOS: bluffs of barranca above Cuernavaca, altitude about 1950 m., a shrub 5 m. high, Nov. 15, 1895, *C. G. Pringle 6210*, flowers and young fruits (A, C, F, G, M-2, Mo, NY, P, US). STATE OF MEXICO: Distrito de Temascaltepec, Acatitla, shrub 3 m. high on hill, Jan. 16, 1933, *G. B. Hinton 3151*, young fruits (K, US).

The Oaxaca collections agree uniformly with the type material (*Liebmann 4044* from Ejutla). The collections of Seler, Pringle, and Hinton from the states of Puebla, Morelos, and Mexico, respectively, differ from the Oaxaca specimens in the following minor characteristics: branchlets densely grayish puberulent, petals rufous-punctate between the veins, and filaments only 2 to 2.5 mm. long. In *Pringle 6210*, the petals are suborbicular. These variations in the northern half of its range link *W. persicifolia* very closely to *W. lanceolata* of Guerrero.

4. WIMMERIA LANCEOLATA Rose, *Contrib. U. S. Nat. Herb.*, 12: 283. 1909. (Pl. I, Fig. 1.)

A shrub 3 to 5 m. high (Rose, Pringle); branchlets pale, glabrous or puberulent only at the nodes. Leaves subchartaceous to subcoriaceous, slightly paler beneath. Petioles 8 to 18 mm. long, slender, weak, shallowly canaliculate or subterete, glabrous or puberulent along the medial ridge above. Leaf blades lanceolate or ovate, 5 to 10.5 cm. long, 2 to 3.5 cm. wide, apex long attenuate-acuminate, base long acuminate or abruptly short acuminate, decurrent, costa prominent beneath, less conspicuous above, venation faint, minutely areolate, especially above, entirely glabrous, margin minutely serrulate, the teeth usually subequal, not uniform. Cymes 3.3 cm. long or less, usually long-pedunculate, open, with 10 or fewer flowers, sometimes reduced to 2 or 3 flowers, the branches puberulent at the nodes or entirely gla-

brous. Bracts sometimes leafy and persistent, as much as 3.8 cm. long (*Rose 9287*), usually much smaller, often minute and deciduous (*Pringle 10392*), bractlets minute, deciduous early. Pedicels slender, glabrous, 5 to 10 mm. long, jointed at base. Calyx usually 5-lobed, rarely 4-lobed, lobes subequal (*Rose 9287*), broadly rounded, 1.5 to 2 mm. wide, minutely apiculate, minutely erose-ciliate, lobes unequal (*Pringle 10392*), broadly rounded or subtruncate, 1.3 to 2.7 mm. wide, minutely apiculate, not ciliate. Petals usually 5, rarely 4, rather thin, 5- to 8-veined, minutely puberulent outside, depressed-suborbicular or ovate-orbicular, 2.8 to 3.4 mm. long medially, with the overlapped margin prolonged laterally at apex as much as 1 mm., 3.3 to 4 mm. wide, conspicuously punctate between veins, margin minutely erose, sometimes angled on the free side. Stamens usually 5, rarely 4; filaments about 3 mm. long; anthers 1.3 or 1.4 mm. long. Ovary narrowly 2-, 3-, or 4-winged or angled, usually 3-celled, rarely 2- or 4-celled, base immersed in disk, rufous-punctate. Style rather thick, terete, 1 mm. long or less. Stigma bifid or trifid. Fruits usually 3-winged, rarely 2- or 4-winged, broadest above the middle, much wider than long, 9 to 13.5 mm. long, 14 to 19 mm. wide, strongly notched at apex and base, the wings divaricate; 1-seeded.

Type locality.—Iguala, Guerrero, Mexico.

Distribution.—Guerrero, Mexico.

Specimens examined.—GUERRERO: near Iguala, Aug. 10, 1905, *J. N. Rose, Jos. H. Painter, and J. S. Rose 9287*, flowers, type (US), type collection (G, M-fragment, NY). Hills near Iguala, altitude about 1300 m., July 30, 1907, *C. G. Pringle 10392*, flowers (G-2, M-2, US). Hillsides, Balsas Station, altitude about 650 m., Sept. 27, 1905, *Pringle 13511*, fruits (M, US-2).

W. lanceolata is a species in the narrower sense, related very closely to *W. persicifolia*. The faint venation and slightly coarser toothing of the leaves of *W. lanceolata*, combined with differences in the fruits between the two species, are distinguishing characteristics. The flowers are variable, as evidenced by the two collections from Iguala, closely approaching flowers of *W. persicifolia* from Morelos (*Pringle 6210*), but differing in minor aspects.

5. Wimmeria acapulcensis Lundell, *Bull. Torrey Bot. Club*, 65: 465. 1938.

"A spreading shrub 24 dm. high" (Rose); branchlets pale, rather stout, compressed and strongly striate, puberulent around the nodes, glabrous otherwise. Leaves subcoriaceous, brittle, slightly paler beneath, borne mainly on short spurlike branches. Petioles 5 to 15 mm. long, slender, shallowly canaliculate, puberulent above, the medial ridge conspicuous. Leaf blades lanceolate or ovate, 4.5 to 7 cm. long, 2 to 3.8 cm. wide, apex bluntly obtuse to rounded, base attenuate, acuminate, decurrent, costa prominent at base beneath, less conspicuous above, becoming faint near the apex, veins nearly plane above, whitened, impressed and almost obsolete beneath, margin remotely and inconspicuously serrulate with minute appressed nigrescent teeth. Cymes puberulent, long-pedunculate, forked 1 to 3 times, the ultimate branches shortened, crowding the flowers. Bracts and bractlets minute, with toothed margins, the teeth red. Pedicels slender, puberulent only at base, 5 to 6 mm. long, jointed at base. Calyx 5-lobed, the lobes unequal, broadly rounded, 1.4 to 2.5 mm. wide, minutely apiculate, very minutely erose-ciliolate. Petals 5, minutely puberulent outside, 7- or 8-veined, suborbicular, 3 mm. long medially, with the overlapped margin prolonged laterally at apex as much as 0.8 mm., about 3.2 mm. wide, rufous-punctate, the free margin very minutely ciliolate, overlapped margin erose. Stamens 5; filaments about 2.3 mm. long; anthers 1 mm. long. Disk minutely papillate. Ovary 3-winged, rarely 2-winged, 3-celled, rarely 2-celled, base submerged in disk. Style thick, terete, about 0.8 mm. long. Stigma subcapitate, trifid, rarely bifid. Fruits 3-winged, rarely 2-winged, usually broadest at the middle, depressed-orbicular, much wider than long, 13 to 18 mm. long and 18 to 22.5 mm. wide, deeply notched at apex and base; 1-seeded.

Type locality.—Acapulco, Guerrero, Mexico.

Illustration.—*Bull. Torrey Bot. Club*, 65: 466. 1938.

Distribution.—Known only from the type collection.

Specimens examined.—Guerrero: Acapulco and vicinity, Nov., 1894, *Edward Palmer 124*, flowers and fruits, type (A), type collection (G, M-fragment, Mo, US).

Palmer 124 was described by Rose, who made the untenable proposal to retain the name *W. pallida* Radlk., for the plant (*Contrib. U. S. Nat. Herb.*, 5: 130. 1897). *Hartweg 41* is the type collection of *W. confusa* Hemsl., and *W. pallida* Radlk. (as to flowers). *W. confusa* has priority, hence *W. pallida* is clearly a synonym.

W. acapulcensis is very distinct from *W. confusa*, differing markedly in its much larger bluntly obtuse or rounded leaves and larger fruits. It is also related to *W. lanceolata* and *W. persicifolia* but may be readily distinguished, for both of these have long attenuate-acuminate leaves.

6. WIMMERIA CONFUSA Hemsl., *Diag. Pl. Mex.*, p. 6. 1878.

W. pallida Radlk., *Sitzungsb. math. phys. Akad. Wiss. München*, 8: 379. 1878.

W. crenata Liebmann (in herb.).

A shrub or small tree 2 to 5 m. high, with bark that peels off freely in dry periods; wood very durable in dry places; branchlets slender, densely puberulent. Leaves small, chartaceous or subcoriaceous, brittle, very slightly paler beneath. Petioles slender, 1.5 to 4 mm. long, rarely up to 6 mm. long, usually puberulent, especially above. Leaf blades variable, ovate, lanceolate, linear-lanceolate, spatulate, oblanceolate, or obovate, usually 1.8 to 3.5 cm. long, sometimes as much as 4.8 cm. long, usually 4 to 11 mm. wide, sometimes as much as 20 mm. wide, apex obtuse or rounded, rarely acute, base cuneate, entirely glabrous beneath, glabrous above except along the costa, costa rather conspicuous on both sides at base, becoming faint toward the apex, puberulent at base above, venation variable, usually faint, finely reticulate or obsolete, margin minutely crenulate-serrulate, callose. Cymes 1.5 cm. long or less, rarely 2 cm. long, densely pulverulent-puberulent, long-pedunculate, usually 3-flowered, rarely reduced to 1 flower, sometimes 4- to 7-flowered. Bracts sometimes leafy, as much as 13 mm. long, usually small, bractlets minute. Pedicels pulverulent-puberulent, slender, 5 to 7 mm. long, jointed at or near the base. Calyx deeply 5-lobed, the lobes unequal, minutely apiculate, broadly rounded or subtruncate, 1 to 2.3 mm. wide, pulverulent, margin minutely erose-ciliolate. Petals 5, pulveru-

lent, conspicuously punctate between veins, 5- or 7-veined, broadly obovate or suborbicular, 3 to 4 mm. long medially, rarely only 2.5 mm. long, with the overlapped margin prolonged laterally at apex as much as 1 mm., overlapped margin often erose. Stamens 5; filaments 2.5 to 3 mm. long; anthers 1 to 1.3 mm. long, sometimes apiculate. Ovary narrowly 2- or 3-winged or angled, 2- or 3-celled, small, rufous-punctate, base submerged in disk. Style terete, usually equaling ovary in length, sometimes shorter, as much as 1.5 mm. long. Stigma bifid or trifid. Fruits usually 3-winged, sometimes 2-winged, broadest below the middle, 11 to 13 mm. long, 13.5 to 16 mm. wide, the persistent stigma and style sometimes as much as 2 mm. long, deeply notched at apex and base; 1-seeded, the seed lanceolate-linear, about 7.5 mm. long (*Rose 12715*), dark red, finely verrucose; endosperm abundant; cotyledons equal, flat, linear-lanceolate, about 6 mm. long, rounded at apex; radicle 1 mm. long.

Type locality.—"Aguas Calientes," Zacatecas, Mexico.

Illustrations.—*W. concolor*, non Schl. & Cham., *Hooker's Icones*, 4: 356. 1841. *Bull. Torrey Bot. Club*, 65: 468. 1938.

Distribution.—Oaxaca, Zacatecas, Jalisco, Durango, Sinaloa, Sonora, and Chihuahua, Mexico.

Specimens examined.—ZACATECAS: "Aguas Calientes," 1837, *Theodor Hartweg 41*, flowers, type (K-2), type collection (G, US-fragment). OAXACA: Pochutla, 1841–43, *F. M. Liebmann 111*, fruits (F-fragment). JALISCO: without locality, 1886, *Edward Palmer 368*, flowers (G, NY, U, US). Bolaños, Sept. 10–19, 1897, *J. N. Rose 2864*, flowers (US); *Rose 2936*, fruits (G, K, NY, US). DURANGO: without locality, Aug. 15, 1897, *Rose 2292*, flowers (US). SINALOA: Lodiego, Oct. 9–25, 1891, *Palmer 1598*, flowers or young fruits (F, G, NY, US-2). Vicinity of Culiacán, Oct. 20, 1904, *T. S. Brandegee*, fruits (C, G, US). Culiacán, altitude 60 m., Sept. 1922, *B. P. Reko 4439*, fruits (US). Cerro del Perico, San Ignacio, altitude 680 m., a shrub 4 to 5 m. high, Sept. 2, 1918, *M. N. Montes and A. E. Salazar 541*, flowers (F, K, M, US). Without locality, *Montes and Salazar 823*, sterile (US). La Peonia, Choix, altitude 640 m., common, wood very durable in dry places, Sept. 26, 1919, *Montes and Salazar 885*, fruits (US-2). Without locality, 1926, *Jesus G. Ortega 6340*, flower buds (US).

Sonora: Alamos, Sept. 16–30, 1890, *Palmer 648*, young fruits (G, US). Vicinity of Alamos, along an arroyo, height 2 m., Mar. 13, 1910, *Rose, Standley, and Russell 12715*, mature fruits (NY, US). Chihuahua: Hacienda San Miguel, near Batopilas, Sept., 1885, *Palmer 120*, flowers (G, K, Mo, U). Mountains above Batopilas, altitude 2300 m., Oct. 1885, *Palmer 261*, flowers (C, G, P, U, US); *Palmer 262*, fruits (C, G, M, US). Batopilas, Oct. 6, 1898, *E. A. Goldman 227*, fruits (F, G, US). Guasaremos, Río Mayo, tropical Sonoran zone on hillside, small tree, the bark of which peels off freely in dry periods, Sept. 27, 1935, *Howard Scott Gentry 1879*, flowers (A, F, Mo, P).

Vernacular names.—*Algodoncillo* (*Montes and Salazar 541*); *Acedilla* (*Montes and Salazar 823*); *Cedilla* (*Montes and Salazar 885*); *Papelio* (*Gentry 1879*).

Hartweg 41, the type of both *W. confusa* and its synonym, *W. pallida*, is represented in the Royal Botanic Gardens, Kew, by two specimens, one labeled "Aguas Calientes" and another "Zacatecas." Inasmuch as Hemsley cites the "Aguas Calientes" specimen, the one so labeled is regarded as the actual type. The two *Hartweg 41* specimens at Kew and the duplicate in Gray Herbarium agree in all characteristics.

W. confusa is variable, as should be expected from its wide range through western Mexico from Oaxaca north to Sonora and Chihuahua. In its densely puberulent branchlets, small leaves, glabrous except for the puberulent petioles and costa above, puberulent few-flowered inflorescence, especially the pulverulent-puberulent pedicels, the fruits broader below the middle, the species is rather uniform throughout its range. Although the leaves vary considerably in outline and venation, these variations do not appear constant enough in this instance to be given serious consideration. Collections in the southern part of its range tend to be less puberulent and have more prominently veined ovate leaves.

7. Wimmeria microphylla Radlk., *Bot. Centralbl.*, 15: 359. 1903. (Pl. II.)

A shrub 2 to 3 m. high (Pringle); branches rather thick, short, glabrate; branchlets short, canescent-pilose, usually reduced to

spurs; internodes very short, making the leaves appear fascicled at the tips of the spurlike branchlets. Leaves small, short pilose beneath, short pilose or puberulent above, pulverulent, chartaceous or subcoriaceous, brittle, subsessile or with petioles up to 3 mm. long, the blades elliptic, oblong, or narrowly obovate, usually 1 to 1.5 cm. long, sometimes as much as 2.5 cm. long, usually 4 to 7 mm. wide, sometimes as much as 10 mm. wide, apex rounded, slightly emarginate, or rarely acute, often minutely apiculate, base acuminate, paler beneath, margin subentire or minutely serrulate, costa elevated beneath, plane and whitened above, veins whitened and evident above, less conspicuous beneath. Cymes short pilose, 1.5 cm. long or less, usually 3-flowered, sometimes reduced to 1 flower, pedunculate. Bracts usually small, sometimes foliaceous, linear, as much as 4 mm. long, bractlets small. Pedicels short pilose, slender, 4 to 8 mm. long. Calyx short pilose, deeply 5-lobed, the lobes unequal, acute, acuminate, or apiculate-rounded, 0.9 to 2 mm. wide, margin erose-denticulate, the teeth usually rufous. Petals 5, suborbicular, ovate-elliptic, or rhombic-orbicular, 2 to 3 mm. long medially, with the overlapped margin prolonged laterally at apex as much as 0.4 mm., rufous-punctate between the veins, usually sparsely puberulent outside, margin subentire or minutely erose. Stamens 5; filaments 2 to 2.5 mm. long; anthers usually prolonged at apex, obtuse or acuminate, sometimes not prolonged, merely obtuse, 1 to 1.3 mm. long. Ovary narrowly 3- (rarely 2- or 4-) angled or winged, often minutely puberulent, usually 3-celled. Style thick, much shorter than ovary. Stigma usually trifid. Fruits puberulent, usually 3- (rarely 2- or 4-) winged, usually broadest at the middle (*Purpus 5701*), 10 to 11.5 mm. long, 12 to 13 mm. wide, notched at apex and base; seed 1, erect, 3-angled, about 6 mm. long, dark red, finely verrucose; cotyledons equal, lanceolate-oblong, about 4.4 mm. long, 1.9 mm. wide; radicle 1.2 mm. long.

Type locality.—Tehuacán, Puebla, Mexico.

Distribution.—Puebla and Oaxaca, Mexico.

Specimens examined.—Puebla: Tehuacán, Dec., 1841, *F. M. Liebmann 14887*, young fruits (F-fragment). Tehuacán, on calcareous hills, altitude about 1750 m., Dec. 24, 1895, *C. G.*

Pringle 6289, flowers, type collection (A, C, F, G, M, Mo, NY, P, US); Aug. 28, 1897, *Pringle 6688*, flowers (A, C-2, F, G, M-2, Mo, NY, P, US). Near Tehuacán, Aug. 1–2, 1901, *J. N. Rose and Robert Hay 5848*, young fruits (US). Near El Riego, Tehuacán, Sept., 1905, *Rose and Painter 10013*, flowers (NY, US). Near Tehuacán, Aug. 30–Sept. 8, 1905, *Rose, Painter, and Rose 10129*, flower buds (US); Aug. 31–Sept. 1, 1906, *Rose and Rose 11242*, flowers (NY, US). Between Tehuacán and Esperanza, Sept. 14, 1906, *Rose and Rose 11434*, flowers (NY, US). Vicinity of San Luis Tultitlanapa, July, 1908, *C. A. Purpus 2713* in part, flowers (C, D, F, G, Mo, NY, US). Río de San Francisco, Aug., 1909, *Purpus 3975*, flowers (C). Tehuacán, Sept., 1911, *Purpus 5701*, fruits (C, F, G, Mo, NY, US). Oaxaca: Mesa de Coscomate, near Los Naranjos, Aug., 1907, *Purpus 2713* in part, flowers and young fruits (C).

8. Wimmeria pubescens Radlk., *Sitzungsb. math. phys. Akad. Wiss. München*, 8: 378. 1878. (Pl. III.)

W. guatemalensis Rose, *Contrib. U. S. Nat. Herb.*, 12: 283. 1909.

A shrub or small tree (Purpus), 5 m. high, growing in groves; branchlets short pilose, slender, often reduced and spurlike. Leaves small, chartaceous, paler beneath, subsessile or with petioles up to 2.5 mm. long, the blades cuneate-obovate or oblanceolate-oblong, 1 to 3 cm. long, usually 0.6 to 1.3 cm. wide, sometimes as much as 1.7 cm. wide, apex obtuse, rounded, or emarginate, base cuneate, petioles and undersurface sparsely short pilose, with age nearly glabrous above except at base and along the costa, costa slender, elevated beneath, less conspicuous and short pilose above, the main lateral veins ascending at an acute angle, prominulous beneath, often slightly impressed above, margin subentire, obsoletely and remotely serrulate. Cymes 1.5 cm. long or less, short pilose, pedunculate, usually 3- to 7-flowered, sometimes 14-flowered. Bracts and bractlets small. Flowers small, punctate, usually conspicuously rufous-punctate. Pedicels puberulent, slender, 3.5 to 6.5 mm. long. Calyx puberulent, deeply 5-lobed, the lobes unequal, minutely apiculate, broadly rounded, 0.9 to 1.4 mm. wide. Petals 5, ovate or elliptic, 2 to 2.4

mm. long medially, minutely apiculate, with the overlapped margin prolonged laterally at apex as much as 0.4 mm., glabrous, margin nearly entire. Stamens 5; filaments 2 to 2.6 mm. long; anthers about 0.7 mm. long, sometimes minutely apiculate, but not prolonged at apex as in *W. microphylla*. Ovary small, narrowly 3-angled or winged, often very minutely puberulent, 3-celled, base submerged in disk. Style elongated, slender, distinct, terete, as much as 1 mm. long, sometimes equaling the ovary in length. Stigma subcapitate, trifid. Fruits sparsely puberulent or glabrate, 3-winged, usually broadest above or at the middle, rarely broadest below the middle at maturity, 10 to 15 mm. long, 13 to 17 mm. wide, notched at apex and base; 1-seeded, the seed triquetrous, about 7.5 mm. long, dark red, finely verrucose; endosperm abundant; cotyledons 2, rarely 3, equal or nearly so, lanceolate-linear, about 6 mm. long, 1.5 mm. wide (*Liebmann 14888*), flat or slightly keeled, apex bluntly obtuse; radicle about 0.7 mm. long.

Type locality.—Consoquitla, Vera Cruz, Mexico.

Distribution.—Vera Cruz, Mexico, and Guatemala.

Specimens examined.—Vera Cruz: Consoquitla, Aug., 1841, *F. M. Liebmann 1045*, flowers (C, US), *Liebmann 4045*, flowers (F, US). Consoquitla, Oct., 1841, *Liebmann 4046*, fruits (F, NY, US); *Liebmann 4047*, fruits (US), *Liebmann 14888*, fruits (F). Carrizal, a tree 5 m. high, Sept. 17, 1906, *C. R. Barnes, C. J. Chamberlain, and W. J. G. Land 26*, fruits (F). Zacuapán, Consoquitla, a small tree or large shrub growing in groves, Sept., 1906, *C. A. Purpus 2020*, fruits (C, F, G, Mo, NY, US). Puente Nacional, Sept., 1912, *Purpus 6007*, flower buds (C, G). Carrizal, Aug., 1912, *Purpus 6008*, flowers (C, F, G, M-fragment, Mo, NY, US). San Martin, Zacuapán, July, 1917, *Purpus 7803*, flowers (C, G, Mo, NY, US). Zacuapán, altitude 900 m., 1917, *Purpus 2020*, flowers (A). Palmar, a spreading tree 5 m. high, Sept. 7, 1937, *L. H. MacDaniels 919*, fruits (F). Guatemala: along road near Nenton, altitude 1000 to 1300 m., Dec. 13–15, 1895, *E. W. Nelson 3522*, fruits (G; US-type of *W. guatemalensis*).

W. guatemalensis does not appear to differ in any essential characteristics from *W. pubescens*. The fruits are sparsely puberu-

lent as in *W. pubescens*, not glabrous as stated by Rose (*Contrib. U. S. Nat. Herb.*, 12: 283. 1909). The leaves and fruits of *Nelson 3522* are immature, which accounts for minor differences in aspect. Rose first referred the Guatemalan specimens to *W. pubescens* (*Contrib. U. S. Nat. Herb.*, 5: 129. 1897.)

9. WIMMERIA OBTUSIFOLIA Standl., *Field Mus. Bot.*, 8: 20. 1930. (Pl. IV.)

A tree reaching a height of 15 m. and a diameter of 25 cm.; bark smooth, whitish; trunk unsymmetrical, grooved (Lundell and Lundell); branchlets slender, pale, puberulent. Leaves small, pallid, nearly concolorous, chartaceous, brittle. Petioles slender, puberulent, 4 or 5 mm. long. Leaf blades elliptic, 3 to 4.5 cm. long, 1.3 to 2.5 cm. wide, apex usually attenuate, obtuse, sometimes rounded or emarginate, base acute, margin subentire, with minute remote inconspicuous appressed teeth, sparsely puberulent on both surfaces, especially along the costa and veins, costa slender, elevated on both surfaces, becoming faint toward the apex, main lateral veins 4 or 5 on each side, slender, elevated above, less conspicuous beneath, ascending at an acute angle. Cymes 2 cm. long or less, densely puberulent, long-pedunculate, open, 3- to 7-flowered. Bracts and bractlets small. Pedicels puberulent, slender, 5 to 8 mm. long, jointed at or above the base. Calyx pulverulent, rufous-punctate, deeply 5-lobed, the lobes very unequal, broadly rounded, 1 to 2.8 mm. wide. Petals 5, darkly rufous-punctate, especially between the veins, usually obovate, sometimes suborbicular, 3 to 3.5 mm. long medially, with the overlapped margin prolonged laterally at apex 0.3 mm. or less, subentire. Stamens 5; filaments 2.4 to 3 mm. long; anthers about 1 mm. long. Disk black-punctate. Ovary small, 3-angled, 3-celled, rufous-punctate, base submerged in disk. Style equaling or longer than ovary, as much as 1.7 mm. long. Stigma trifid. Fruits not known.

Type locality.—Yucatán, Mexico.

Distribution.—In advanced deciduous forest of southeastern Yucatán, Mexico.

Specimens examined.—YUCATÁN: without locality, 1917–21,

G. F. Gaumer 24259, flowers, type (F), type collection (A, M-fragment, Mo, NY, US). Along road between Pisté and Yokdzonoot, July 11, 1938, *C. L. Lundell and Amelia A. Lundell 7862*, flower buds (M). Dzibiac, July 14, 1938, *Lundell and Lundell 7928*, flower buds (M). South of Pisté, Aug., 1938, *Lundell and Lundell 8216*, flower buds (M).

Vernacular name.—*Amche* (*Lundell and Lundell 7928*). In Maya, *am* is spider and *che* is wood or tree. Thin flexible strands from a broken leaf or piece of bark suggest a spider's web, whence the name *amche* ("spider tree").

Economic value: Wood utilized for construction purposes (*Lundell and Lundell*).

W. obtusifolia, which has bark and trunk suggestive of *Pimenta officinalis* Lindl., is one of the distinctive components of the advanced deciduous forest of southeastern Yucatán. The Indians of Pisté state that it is common in the hinterland south of their village.

10. Wimmeria cyclocarpa Radlk., *Bot. Gaz.*, 18: 199. 1893.

A tree, about 10 m. high; branchlets slender, canescent, pubescent. Leaves thin, slightly paler beneath. Petioles densely pubescent, 3 to 9 mm. long. Leaf blades ovate, ovate-lanceolate, or elliptic, 4 to 7.5 cm. long, 1.8 to 4.4 cm. wide, apex usually acuminate, sometimes obtuse, base rounded and abruptly acutish, or subacuminate, short pilose on both surfaces, especially along the costa and veins, sometimes glabrate above with age except along the veins, margin minutely serrulate, costa elevated beneath, nearly plane above, main lateral veins 4 to 6 on each side, arcuately ascending, prominulous on both surfaces. Cymes pedunculate, densely pubescent, apparently 7- to 14-flowered. Pedicels short pilose, 3 to 5 mm. long. Calyx sparsely puberulent, deeply 5-lobed, the lobes unequal, acute or apiculate-rounded, 0.5 to 1.4 mm. wide, margin entire. Petals 5, glabrous, rufous-punctate, ovate-orbicular, about 2 mm. long medially, the overlapped margin prolonged laterally at apex about 0.2 mm., entire or nearly so. Stamens 5; filaments 2 to 2.5 mm. long; anthers 0.8 to 1 mm. long. Ovary small, 3- (rarely 2- or 4-) angled, usually 3-celled, base submerged in disk. Style rather slender, nearly

equaling or shorter than ovary. Fruits 3-winged, sparsely puberulent, broadest at or below the middle, 18 to 25 mm. long, 20 to 28 mm. wide, notched at apex and base; 1- or 2-seeded, the seed 8.5 to 10 mm. long, dark red, finely verrucose; cotyledons oblong-lanceolate, 7 to 8 mm. long, 1.8 to 2 mm. wide, rounded at apex; radicle about 1.2 mm. long.

Type locality.—Slopes of Volcán de Jumaytepeque, Department of Santa Rosa, Guatemala.

Distribution.—Guatemala and Salvador.

Specimens examined.—GUATEMALA: Department of Santa Rosa, slopes of Volcán de Jumaytepeque, altitude about 1900 m., Sept., 1892, *Heyde and Lux* (*Donnell Smith 3708*), fruits, type (US), type collection (G, Mo, NY, P, US-2); Dec., 1892, *Heyde and Lux* (*Donnell Smith 4125*), fruits (A, F, G, M-2, Mo, NY, US). Without locality, 1892, *E. T. Heyde 332*, fruits (M); without locality, 1892, *Heyde 659*, fruits (US-2). Department of Amatitlán, Amatitlán, altitude 1102 m., Oct., 1928, *Jesus Morales R. 1153*, fruits (F). SALVADOR: Volcán de San Salvador, 1924, *Salvador Calderon 2259*, fruits (F, G, NY, US).

Vernacular names.—*Lupita* (*Calderon 2259*); *Palo de danta* (*Morales 1153*).

The pubescent leaves, largest in the section Trichocarpae, small flowers, and the large puberulent fruits are characteristics by which *W. cyclocarpa* may be readily recognized. The flowers were described from dried remains persisting at the base of the fruits. No flowering specimens were available.

DOUBTFUL SPECIES

11. WIMMERIA SERRULATA (DC.) Radlk., *Sitzungsb. math. phys. Akad. Wiss. München*, 8: 379. 1878.

Dodonaea (?) *serrulata* DC., *Prodr.*, 1: 617. 1824.

The original description of this species by DeCandolle is as follows:

D? serrulata, foliis elliptico-oblongis petiolatis serrulatis coriaceis glabris, capsulis coriaceis 3-alatis. In Monte-Video. Fl. et sem. ign.

Radlkofer redescribed the plant:

Folia elliptica, utrinque attenuata, petiolo 1.2 cm. longo adjecto circ. 6 cm. longa, 2 cm. lata, serrulata, tenuiter reticulato-venosa, glabra;

pedicelli glabri; fructus 1 cm. longus, 1.6 cm. latus, apice sinu lato excisus, alis oblique patentibus, apice divaricatis.—Monte-Video?

From the other species in his section Endolophus, Radlkofer separates *W. serrulata* by the following characteristics:

Fructus alae subcoriaceo-chartaceae, nervis crebris parallelis rectis-fibrosae.

The other members of the genus, all of which are Mexican and Central American, differ from *W. serrulata* in having fruits with thin membranous wings. The type "Ex. Herb. Thibaud in Herb. Prodromi DC." has not been available, hence the status of this poorly known species must remain doubtful.

Excluded Species

Wimmeria (?) integerrima Turcz., *Bull. soc. nat. Moscou*, 31, Pt. 1: 451. 1858 = *Zinowiewia integerrima* (Turcz.) Turcz., *Bull. soc. nat. Moscou*, 32, Pt. 1: 275. 1859.

THE AMERICAN SPECIES OF MICROTROPIS

Microtropis Wall. ex Meissn., *Gen.*, p. 68. 1837.

Essential characteristics.—Small trees, epiphytic or terrestrial shrubs, or woody vines, entirely glabrous; branchlets usually opposite, drying reddish black, striate. Leaves decussate-opposite, entire, discolorous, pinnately veined, minutely stipulate, petiolate. Inflorescence cymose, the cymes axillary, solitary, pedunculate, dichasially branched, with each node bibracteate. Bracts and bractlets deltoid, carinate or subcarinate, with the margin minutely erose-denticulate, reddish. Flowers pseudohermaphroditic, green or pale green, usually pentamerous, sometimes tetramerous (excepting ovary), subsessile or with short thick pedicel. Torus patelliform. Sepals imbricate, strongly unequal, suborbicular, the inner often equaling the petals in size, persistent at base of fruits. Petals entirely free, alternate with sepals, imbricate, attached to base of disk, suborbicular. Disk well developed, usually pentagonous, annular or subcupular, confluent with base of ovary, persistent at base of fruits. Stamens opposite the sepals, inserted on angles of disk; filaments subulate; anthers versatile, 2-celled, longitudinally dehiscent. Rudimen-

tary ovary in staminate flowers half or almost entirely submerged in disk. Ovary in pistillate flowers submerged in disk at base, contracted above into a slender conical style, incompletely 2-celled, with 4 collateral ovules on a short central placenta arising from the base. Stigma small, subcapitate. Fruits capsular, coriaceous, septicidally dehiscent, 2-valved, 1-celled, endocarp thinly 2-cristate, the thin septa persisting; 1- or 2-seeded, the seed exarillate, reddish; endosperm abundant, rather hard. Embryo large; cotyledons flat, equal, broadly ovate-elliptic, subcordate; radicle terete, thick.

The first American representative of the genus, *M. occidentalis*, was described by Loesener (*Bot. Gaz.*, 24: 393. 1897), and a second species, *M. Schiedeana*, was published three years later by the same author (*Engl. Jahrb.*, 29: 98. 1900). In his revision of the American species (*Kew Bull.*, p. 362. 1909), Sprague added three more forms, of which only one, *M. guatemalensis*, is referable to the genus, the other two being species of *Myginda*[4] and *Rhacoma*.[5] A fourth species, *M. Standleyi*, was described by Lundell (*Bull. Torrey Bot. Club*, 65: 463. 1938).

M. occidentalis, apparently common in Costa Rica, whence it was described, may occur also in Vera Cruz. *M. Standleyi* is restricted to Costa Rica, whereas *M. guatemalensis* and *M. Schiedeana* are known only from Guatemala and Vera Cruz, respectively. The species are seldom collected and hence are meagerly represented in herbaria.

The American species of *Microtropis* are closely related and vary in minor degrees compared with the Asiatic representatives of the genus. Of the numerous Oriental species, the Occidental forms appear to be linked closest to *M. japonica* (F. & S.) Hallier f. and *M. oligantha* Merr. & Freem. of the Sino-Japanese region.[6]

[4] *Myginda filipes* (Sprague) Loes., *Notizblatt Bot. Gart.*, 13: 226. 1936. *Microtropis filipes* Sprague, *Kew Bull.*, p. 363. 1909.

[5] *Rhacoma parviflora* (Hemsl.) Lundell, *Amer. Midland Nat.*, 20: 238. 1938. *Euonymus parviflorus* Hemsl., *Diag. Pl. Mex.*, p. 6. 1878. *Microtropis parviflora* (Hemsl.) Sprague, *Kew Bull.*, p. 363. 1909.

[6] Dr. E. D. Merrill, of Harvard University, who has undertaken a revision of the Oriental representatives of *Microtropis*, kindly made available a series of specimens of eighteen Asiatic species which have been compared with the American members of the genus.

As a whole the similarities between the American and Asiatic species greatly overshadow the differences; however, the latter are significant.

In the American species the torus is patelliform; the petals are free, and attached to base of disk, which is well developed, annular or subcupular, and thick; the filaments are inserted on the angles of the disk; and the ovary is abruptly contracted into a slender style. In the Asiatic species the torus is suburceolate; the petals are free, or connate at base; the disk is absent, or thin and cupular; the filaments are attached to the short corolla tube, or at base of free petals, or between the angles or lobes of a thin disk; and the style is thick.

These differences give a somewhat dissimilar aspect to the flowers; however, the great variations within the genus, particularly of the corolla, disk, and mode of stamen attachment, preclude any generic separation of the American from the Asiatic forms. In all American and Asiatic species studied, the ovary is incompletely 2-celled, with 4 collateral ovules on a short central placenta arising from the base. This fundamental agreement, with all the other conformities, reveals the congeneric relationship.

Cymes forked 3 to 5 times, the branching strongly divaricate
- Leaves subcoriaceous, main lateral veins 7 to 9 on each side, patent, ascending at a wide angle; Vera Cruz.....3. *M. Schiedeana*
- Leaves chartaceous, main lateral veins 4 or 5 on each side, strongly ascending from base, arcuately ascending from medial region; Costa Rica.....4. *M. Standleyi*

Cymes forked 1 to 3 (rarely 4) times, the branching not strongly divaricate
- Leaves chartaceous, elliptic or broadly oblanceolate-elliptic, 6 to 12.5 cm. long, 2 to 6 cm. wide, apex acuminate; Costa Rica.....1. *M. occidentalis*
- Leaves coriaceous, oblanceolate, 3.5 to 6.5 cm. long, 1.2 to 2.2 cm. wide, apex obtuse or acutish; Guatemala....2. *M. guatemalensis*

1. MICROTROPIS OCCIDENTALIS Loes., *Bot. Gaz.*, 24: 393. 1897.

A small tree 6 m. high or a "woody vine" (Standley); branchlets usually opposite, drying reddish, striate, rather slender. Leaves opposite, entire, chartaceous, dark green above, pale beneath. Petioles canaliculate, 7 to 12 mm. long. Leaf blades elliptic or broadly oblanceolate-elliptic, 6 to 12.5 cm. long, 2 to

6 cm. wide, apex acuminate or obtusish, base broadly cuneate or acutish, decurrent, costa plane or slightly raised above, prominent beneath, main lateral veins arcuately ascending, 5 to 7 on each side, prominulous beneath, less conspicuous above, veinlets finely reticulate. Cymes axillary, solitary, usually 2 cm. long or less, rarely as much as 3.5 cm. long, forked 1 to 3 (rarely 4) times; peduncles 5 to 20 mm. long; primary branches 2 to 6 mm. long, rarely as much as 10 mm. long; ultimate branches shorter. Bracts and bractlets deltoid, 1 to 1.2 mm. long, acute, subcarinate, with the margin minutely erose-denticulate, reddish. Flowers pseudohermaphroditic, pale green, subsessile. Staminate flowers: sepals 5, strongly unequal, the inner largest, depressed-orbicular, 1.3 to 2.5 mm. wide, the margin obscurely and minutely rufous-fimbriate. Petals 5, entirely free, attached to base of disk, suborbicular, 2 to 2.5 mm. long, margin very minutely erose. Disk usually pentagonous, subcupular. Filaments 0.8 to 1 mm. long; anthers broadly cordate, about 0.5 mm. long, minutely apiculate. Rudimentary ovary one-half submerged in disk, the free part tapering into a slender conical style, incompletely 2-celled, with 4 ovules on a short central placenta arising from the base. Pistillate flowers: calyx and corolla the same. Disk thicker, fleshy. Rudimentary stamens smaller; filaments about 0.5 mm. long; anthers about 0.35 mm. long. Ovary broadly ovoid, submerged in disk at base, abruptly narrowed above into a slender conical style, incompletely 2-celled, with 4 collateral ovules on a short central placenta arising from the base. Stigma small, subcapitate, obscurely bifid. Fruits capsular, ellipsoid, 13 to 15 mm. long, short-apiculate, coriaceous, dehiscent, 2-valved, 1-celled, endocarp thin, 2-cristate, the thin septa persisting; 1-seeded, the seed exarillate, reddish; endosperm abundant, rather hard. Embryo large; cotyledons flat, equal, broadly ovate-elliptic, 8 to 8.5 mm. long, 6.5 to 7 mm. wide, apex rounded, base broadly subcordate; radicle terete, 2 to 2.5 mm. long, 1 to 1.4 mm. in diameter.

Type locality.—Volcán de Poas, Province of Alajuela, Costa Rica.

Distribution.—Costa Rica.

Specimens examined.—Costa Rica: Province of Alajuela, Volcán de Poas, altitude about 2650 m., Mar., 1896, *J. Donnell Smith 6470*, pistillate flowers and fruits, type collection (US-2). Viento Fresco, altitude 1600–1900 m., a tree 6 m. high, flowers pale green, in wet forest, Feb. 13, 1926, *P. C. Standley and Ruben Torres R. 47729*, pistillate flowers (F, M, US). Province of San José, near Laguna de la Escuadra, northeast of El Copey, altitude 2000–2200 m., a small vine, flowers greenish white, in dense oak and bamboo forest, Dec. 16, 1925, *Standley 41961*, staminate flowers (F, US). Near Quebradillas, about 7 km. north of Santa María de Dota, altitude about 1800 m., a large woody vine, flowers pale green, in oak forest, Dec. 24, 1925, *Standley 42895*, sterile (F, US).

A Mexican collection, *Schiede*, Sept., 1829, Cumbre del Obispo, between Papantla and Misantla, Vera Cruz, may be referred to *M. occidentalis* tentatively, a positive identification not being possible from the material available.

It is noteworthy that Standley describes the pistillate plant as a tree and the staminate plant as a woody vine.

2. Microtropis guatemalensis Sprague, *Kew Bull.*, p. 364. 1909. (Pl. V.)

Branchlets usually opposite, rather thick, at first tetragonal, drying blackish. Leaves small, coriaceous, much paler beneath, margin entire, slightly revolute. Petioles canaliculate, 4 to 5 mm. long. Leaf blades oblanceolate, 3.5 to 6.5 cm. long, 1.2 to 2.2 cm. wide, apex obtuse or acutish, base cuneate, costa slightly elevated above, prominent beneath, main lateral veins patent, only slightly ascending, 5 to 7 on each side, prominulous beneath, less conspicuous above, veinlets inconspicuous. Cymes less than 1.5 cm. long, once or twice forked, each node bibracteate; peduncles rather thick, 3.5 to 6 mm. long; primary branches 2 to 3 mm. long; secondary branches about 1 mm. long, 1-flowered. Bracts and bractlets semicymbiform, 1 to 1.5 mm. long, margin erose-denticulate, reddish. Pistillate flowers, excepting ovary, usually pentamerous, sometimes tetramerous (one flower found with 7 stamens), subsessile, the pedicels less than 1 mm. long, thick.

Sepals strongly unequal, depressed-orbicular, the 2 outer 1.4 to 2 mm. wide, the inner 2.2 to 3 mm. wide, margin minutely lacerated, reddish. Petals suborbicular, 2 to 2.2 mm. long, margin very minutely erose. Disk pentagonous, rarely tetragonous, thick, about 2 mm. in diameter, subcupulate, the margin slightly raised. Filaments inserted on angles of disk, about 0.5 mm. long; rudimentary anthers about 0.4 mm. long. Ovary submerged in disk at base, abruptly contracted above into a slender conical style 0.5 to 0.75 mm. long, incompletely 2-celled, with 4 collateral ovules on a short central placenta. Stigma subcapitate. Staminate flowers and fruits unknown.

Type locality.—Chiúl, Department of Quiché, Guatemala.

Distribution.—Known only from the type collection.

Specimens examined.—GUATEMALA: Department of Quiché, Chiúl, altitude 2600 m., April, 1892, *Heyde and Lux* (*Donnell Smith 3088*), pistillate flowers, type collection (A, G, NY, US-2).

3. MICROTROPIS SCHIEDEANA Loes., *Engl. Jahrb.*, 29: 98. 1900. (Pl. VI.)

Branchlets usually opposite, rather thick, at first angled and striate, drying blackish. Leaves subcoriaceous or subchartaceous, paler beneath, margin entire, slightly revolute. Petioles canaliculate, 5 to 8 mm. long. Leaf blades elliptic or elliptic-oblong, 4.5 to 8.5 cm. long, 2 to 4 cm. wide, apex obtuse or obtusely subacuminate, base acutish, costa slightly elevated or nearly plane above, prominent beneath, main lateral veins 7 to 9 on each side, patent, only slightly ascending, rather prominent beneath, prominulous above, veinlets inconspicuous. Cymes as much as 3.5 cm. long, divaricately forked 3 or 4 times, each node bibracteate; peduncles thick, 6 to 18 mm. long; primary branches 4 to 8 mm. long; ultimate branches shorter. Bracts and bractlets carinate, 1 to 1.5 mm. long, margin erose-denticulate, reddish. Flowers, excepting ovary, pentamerous or tetramerous, subsessile. Sepals strongly unequal, depressed-orbicular, margin minutely lacerated. Petals suborbicular, margin minutely lacerated. Disk wide, subcupular. Stamens inserted on margin of disk. Ovary submerged in disk at base, contracted above into a conical style,

incompletely 2-celled, with 4 collateral ovules on a short central placenta.

Type locality.—Chiconquiaco, between Misantla and Jalapa, Vera Cruz, Mexico.

Distribution.—Known only from the type collection.

Specimens examined.—Vera Cruz: Chiconquiaco, between Misantla and Jalapa, Sept., *Schiede*, flower buds, type collection (M-fragment, K).

Only flower buds are available, hence no measurements are given for the flower parts.

4. Microtropis Standleyi Lundell, *Bull. Torrey Bot. Club*, 65: 463. 1938.

An epiphytic shrub about 2 m. high, not scandent (Standley and Valerio), or a tree about 6 m. high, 25 cm. in diameter (Smith); branchlets usually opposite, rather slender, striate, drying reddish black. Leaves chartaceous, paler beneath, margin entire, slightly revolute. Petioles canaliculate, 5 to 8 mm. long. Leaf blades lanceolate-elliptic or oblong-elliptic, 5.5 to 9.5 cm. long, 1.8 to 3.8 cm. wide, apex short acuminate, the acumen obtusish, base cuneate or acutish, costa prominent beneath, prominulous above, main lateral veins 4 or 5 on each side, strongly ascending from base, arcuately ascending from medial region, prominulous beneath, fainter above, veinlets inconspicuous. Cymes 2.3 cm. long or less, divaricately forked 3 to 5 times, each node bibracteate; peduncles stout, 3.5 to 7.5 mm. long; primary branches 2 to 4 mm. long; ultimate branches shorter. Bracts and bractlets semicymbiform, 1 to 1.5 mm. long, margin minutely erose, reddish. Staminate flowers green or pale green, pentamerous or tetramerous (excepting ovary), subsessile or with a very short thick pedicel. Sepals strongly unequal, suborbicular or broadly ovate-orbicular, the 2 outer 1.2 to 1.4 mm. wide, the inner 1.5 to 2.2 mm. wide, margin obscurely and minutely erose, reddish. Petals broadly obovate or suborbicular, 2 to 2.4 mm. long, margin very minutely erose. Disk usually pentagonous, rather thick, about 1.8 mm. wide, subcupular. Filaments inserted on angles of disk, about 1 mm. long; anthers broadly cordate,

about 0.5 mm. long, short apiculate. Rudimentary ovary almost entirely submerged in disk, contracted above into a short style, incompletely 2-celled, with 4 collateral ovules on a short central placenta. Pistillate flowers unknown. Capsules "ripening blackish," thickly coriaceous, obovoid, 12 to 15 mm. long, about 7.5 mm. in diameter, minutely apiculate, 2-valved, 1-celled, septicidally dehiscent, the thin septa persisting; 1- or 2-seeded, the seed exarillate, "scarlet"; endosperm abundant, hard; cotyledons flat, equal, broadly ovate, about 8 mm. long, 7 to 7.5 mm. wide; radicle about 2 mm. long, terete, thick.

Type locality.—Cerros de Zurquí, northeast of San Isidro, Province of Heredia, Costa Rica.

Distribution.—Costa Rica.

Specimens examined.—Costa Rica: Province of Heredia, Cerros de Zurquí, northeast of San Isidro, altitude 2000–2400 m., Mar. 3, 1926, *P. C. Standley and Juvenal Valerio 50602*, staminate flowers, type (F), type collection (M-fragment, US); *Standley and Valerio 50480*, staminate flowers (F, US). Province of San José, Zurquí, altitude 2000–2500 m., shrub in wet forest, Feb. 13, 1926, *Standley and Valerio 48169*, staminate flowers (US). Palmira, a tree about 6 m. high and 25 cm. in diameter, April 28, 1937, *Austin Smith 4155*, fruits (F).

A REVISION OF THE GENUS ZINOWIEWIA[7]

Zinowiewia Turcz., *Bull. soc. nat. Moscou*, 32, Pt. 1: 275. 1859.

Type species.—*Zinowiewia integerrima* (Turcz.) Turcz.

Essential characteristics.—Trees and shrubs of tropical America, entirely glabrous; branchlets slender, usually drying dark red or reddish black, somewhat compressed at the nodes, the internodes usually elongated. Leaves decussate-opposite, entire, pinnately veined, minutely stipulate, petiolate. Inflorescence cymose, dichasially branched, axillary, subsessile or pedunculate, the primary branches often reduced. Nodes bibracteate;

[7] Since this revision went to press, another species from Mt. Tacana, Chiapas, has been received and will be described in a forthcoming issue of *Lloydia*.

bracts and bractlets small, bearing red teeth on the margin. Flowers perfect, minute, pale green, maroon, tinged maroon or purplish, pedicellate. Torus patelliform. Calyx deeply 5-lobed, very rarely 4- or 6-lobed, the lobes patent, usually rounded. Petals 5, very rarely 4 or 6, alternate with calyx lobes, patent. Stamens 5, rarely 4 or 6, alternate with the petals, inserted on the margin of the disk; filaments filiform-subulate; anthers broadly cordate, 2-celled, longitudinally dehiscent, versatile. Disk thick, fleshy, annular, pentagonal or obscurely 5-lobed. Ovary almost entirely or entirely submerged in disk, 2-celled, with 2 erect ovules in each cell; free part of ovary and style conical, laterally compressed; stigma minute, entire. Fruit a samara with a thin terminal membranous strongly 1-nerved wing, oblanceolate, obovate, or oblong-elliptic, subfalcate or straight; usually 1-celled and 1-seeded, sometimes 2-celled and 2-seeded, the seed erect, subfalcate or straight, linear-oblong, tapering to the obtuse or rounded ends, subterete, filling the cell cavity, the testa red; endosperm abundant; embryo large, straight; cotyledons equal, thin, flat, lanceolate; radicle elongated, quadrangulate.

All the species of *Zinowiewia* apparently are small trees, excepting *Z. australis*, which reaches a height of 20 m., and *Z. rubra*, reported by Skutch as being 30 m. high and having a diameter of almost 1 m. The branchlets are slender, usually dark red or reddish black in the dried state, sometimes whitened, more or less striate, somewhat compressed at the nodes, the internodes usually elongated. The leaves are decussate-opposite, with minute and inconspicuous stipules. The petioles, well developed in all species, generally are slender, elongated, sometimes nearly plane above, often conspicuously canaliculate. Leaf blades vary considerably in shape, ranging from narrowly lanceolate to obovate; the apex is obtuse in *Z. pallida*, subacuminate to acuminate in the remaining species, the acumen bluntly obtuse to acute; the base of the blade usually is decurrent and acute or acuminate; the margin, although entire, may undulate somewhat; it is slightly revolute in some species, plane in others. The blades, thin at first, usually become subcoriaceous or coriaceous with age. In the younger thin leaves, the venation is prominent and reticulate, but

as maturation ensues, the venation often becomes less conspicuous. The costa in many instances is slightly elevated above, especially on the basal half of blade, sometimes impressed or nearly plane, prominent and elevated beneath the entire length, becoming less conspicuous toward the apex. The main lateral veins are slender, 4 to 8 on each side, usually more or less arcuate-ascending, arcuately anastomosing near the margin, often obscure above, prominulous beneath. The veinlet reticulation is fine, distant, open, often inconspicuous in mature leaves. The undersurface is very minutely puncticulate, and decidedly paler in all species excepting *Z. australis* and *Z. rubra*. The discolorous condition is most evident in *Z. pallida*, where the young leaves are whitish beneath.

The cymes are small, not over 5.5 cm. long, often much shorter, axillary, dichasially branched 3 to 8 times, subsessile or pedunculate. In *Z. integerrima* and *Z. concinna* especially, the peduncle is sometimes so greatly reduced that the inflorescence appears to be a fascicle of cymes; this appearance is further heightened by the shortening of the primary branches The reduction of both the peduncle and the primary branches is most pronounced in *Z. integerrima*, the species in which the cymes reach their greatest development. Uniformity in length of peduncle and primary branches is not found in any of the species; cymes with elongated or shortened peduncles and branches are present on the same specimen. With reduction of the peduncles and branches there is crowding of the cymes, very evident in *Z. integerrima*. The pedicels are jointed, and the position of the joint may prove of some specific value. The variations in the inflorescences between the species may eventually aid in their separation; in this tentative revision I have not taken the differences into serious consideration mainly because of insufficient material of critical species. The bracts and bractlets are small and bear red teeth on the margins.

The flowers are minute, perfect, pale green in *Z. integerrima* (Galeotti, Linden) and *Z. pallida* (Lundell), maroon or tinged maroon in *Z. rubra* (Skutch), and purplish in *Z. Matudai* (Matuda). No notes are available for flower color of the other species. The calyx is inferior, pateriform, rather fleshy, deeply 5-lobed,

very rarely 4- or 6-lobed, the lobes spreading, suborbicular, broadly ovate or ovate-triangular, 0.4 to 0.55 mm. long, rounded or obtuse, rarely with red teeth on margin. The corolla is polypetalous, the petals 5, very rarely 4 or 6, alternate with calyx lobes, spreading, ovate, ovate-oblong, broadly ovate, or suborbicular, 1.1 to 2.2 mm. long, 1 to 1.5 mm. wide, rounded, minutely and obscurely erose, 1-nerved. The largest petals are found in *Z. rubra*, the smallest in *Z. integerrima*, *Z. pallida*, and *Z. costaricensis*. The 5, rarely 4 or 6, stamens are alternate with the petals, inserted on the margin of the disk, either on the angles or at the tips of the short lobes. The filaments are filiform-subulate, 0.5 to 0.75 mm. long. The anthers are minute, 0.2 to 0.4 mm. long, broadly cordate, 2-celled, longitudinally dehiscent. The disk is thick, fleshy, annular, usually pentagonal or very shallowly 5-lobed, the margin either plane or slightly elevated. The ovary, almost entirely submerged in disk, is 2-celled, with 2 erect ovules in each cell. Where the ovary is not completely submerged, the free portion and the style are slightly compressed laterally. The subulate-conical style, usually equaling the filaments in length, persists at the apex of the fruit. The minute stigma is entire.

The fruit, a terminal winged samara, is 1-celled and 1-seeded, or rarely 2-celled and 2-seeded. The wing is membranous, strongly 1-nerved medially, oblanceolate, obovate, or oblong-elliptic, with apex acutish, obtuse, rounded, or emarginate, usually apiculate, subfalcate when 1-seeded, straight when 2-seeded, the venation strong or faint, strongly ascending, or nearly horizontal above the middle. The seeds are erect, usually straight, sometimes subfalcate, linear-oblong, as much as 11 mm. long, 3 mm. in diameter, tapering to the obtuse or rounded ends, subterete, filling the cell cavity. The testa is thin and red. The embryo, surrounded by abundant endosperm, is large and straight. The cotyledons are equal, thin, flat, lanceolate, as much as 7.5 mm. long, 2.1 mm. wide, rounded or bluntly obtuse at apex, with the radicle elongated, up to 3 mm. long, terete.

In 1858 Turczaninow described *Wimmeria integerrima*, referring the species questionably to that genus (*Bull. soc. nat. Moscou*, 31, Pt. 1: 451. 1858). The following year he described the

genus *Zinowiewia*[8] based on *Wimmeria integerrima* (*Bull. soc. nat. Moscou*, 32, Pt. 1: 275. 1859). Although various collections were subsequently referred doubtfully to this species, the genus remained monotypic until 1938 when Lundell described 6 additional species (*Bull. Torrey Bot. Club*, 65: 463–76. 1938).

The genus *Zinowiewia*, as narrowly interpreted by the writer, contains 7 closely related species distributed from southern Mexico through Central America to Venezuela. *Z. integerrima* is known only from central Vera Cruz, the large series of specimens from that region being exceptionally homogeneous, agreeing closely with the type collection from Mirador (*Linden 30*). *Z. concinna* is known from the Mexican states of Morelos, Mexico, and Michoacán. *Z. rubra* is endemic in Guatemala, and *Z. Matudai*, a closely related species, has been found only in adjacent Chiapas. The British Honduran tree, *Z. pallida*, has been collected twice. *Z. costaricensis* is known from Costa Rica, with Panama collections being doubtfully referred to the species. *Z. australis*, the South American representative, is restricted to Venezuela and is known only from the type collection. It is noteworthy that all of the species are geographically isolated.

Leaves obtuse
  Leaf blades oblanceolate; flowers pale green, petals 1.2 to 1.3 mm. long, about 1 mm. wide; British Honduras.....3. *Z. pallida*
Leaves subacuminate or acuminate, the acumen acute to bluntly obtuse or rounded
  Samaras oblong-elliptic, acutish or obtusish, broadest near the middle
    Leaf blades yellow-green, callosed-revolute at base; flowers purplish; pedicels less than 0.5 mm. long; samaras 15 mm. long or less, 4 to 5 mm. wide; Chiapas.....6. *Z. Matudai*
    Leaf blades green, not callosed-revolute at base; pedicels 1.2 to 3.5 mm. long
      Petals 2 to 2.2 mm. long, about 1.5 mm. wide, maroon or tinged maroon; pedicels about 1.2 mm. long; samaras about 15 mm. long, 5 mm. wide; Guatemala.....7. *Z. rubra*
      Petals 1.3 to 1.7 mm. long, 1 to 1.2 mm. wide; pedicels 2 to 3.5 mm. long; samaras 20 to 22 mm. long, 6.5 to 8 mm. wide; Morelos, Michoacán, state of Mexico....2. *Z. concinna*
  Samaras oblanceolate or obovate, rounded or emarginate, broadest at or near the apex
    Cymes forked 5 to 8 times, 3 to 5.5 cm. long; leaf blades discolorous, pale, 2.8 to 5 cm. wide, subacuminate, the acumen bluntly

[8] "Dixi in honorem excell. Pauli Zinowiew, Universitatis Charcowiensis curatoris, amatoris et promotoris botanicae strenuissimi."

obtuse or rounded; samaras 22 to 25 mm. long, 7 to 8.5 mm. wide; cotyledons about 1.1 mm. wide; Vera Cruz.....
.....1. *Z. integerrima*

Cymes forked 3 to 5 times, less than 3 cm. long; leaf blades 1.3 to 3.7 cm. wide, acuminate, the acumen acute or acutish

Samaras 1- or 2-seeded, subfalcate or straight, 15 to 21 mm. long, 5 to 6.5 mm. wide; cotyledons about 1.2 mm. wide; leaf blades discolorous, pale, 1.3 to 2.8 cm. wide, acuminate at base; Costa Rica.....4. *Z. costaricensis*

Samaras 1-seeded, subfalcate, 20 to 24 mm. long, 7.5 to 9.5 mm. wide; cotyledons 2 to 2.1 mm. wide; leaf blades dark green on both surfaces, 2.3 to 3.7 cm. wide, base abruptly narrowed, acute; Venezuela.....5. *Z. australis*

1. ZINOWIEWIA INTEGERRIMA (Turcz.) Turcz., *Bull. soc. nat. Moscou*, 32, Pt. 1: 275. 1859. (Pl. VII.)

Wimmeria (?) *integerrima* Turcz., *Bull. soc. nat. Moscou*, 31, Pt. 1: 451. 1858.

A small tree. Leaves subcoriaceous. Petioles 4 to 9 mm. long, shallowly canaliculate. Leaf blades obovate, elliptic, or ovate-oblong, usually 7 to 10 cm. long, sometimes only 4 cm. long, usually 2.8 to 5 cm. wide, sometimes only 2 cm. wide, apex subacuminate, acumen bluntly obtuse, base acute or acuminate, decurrent, costa slender above and elevated nearly entire length, prominent beneath, faintly reticulate-veined, the main lateral veins 5 to 7 on each side. Cymes usually 3 to 4, rarely 5.5 cm. long, sometimes only 2 cm. long, subsessile, short-pedunculate, or sometimes long-pedunculate, the peduncle scarcely 1 mm. long in many instances, sometimes as much as 3 cm. long, the primary branches usually much shortened, the subsessile cymes appearing fascicled, forked 5 to 8 times, crowded, many-flowered. Flowers green (Galeotti, Linden). Pedicels usually 1 mm. long, rarely as much as 2 mm. long. Pedicel of terminal flower in terminal cymules jointed at or near the base, rarely near the middle; pedicels of lateral flowers jointed at or below the middle. Calyx 5-lobed, the lobes very broadly ovate, 0.4 to 0.55 mm. long, rounded or obtuse at apex. Petals 5, broadly ovate, 1.1 to 1.4 mm. long, 0.8 to 1.1 mm. wide. Filaments 0.5 to 0.7 mm. long. Margin of disk slightly raised. Ovary submerged in disk. Fruits broadly oblanceolate or obovate, 2.2 to 2.5 cm. long, 7 to 8.5

mm. wide, bluntly obtusish to rounded, apiculate, the veins strong, ascending. Seed 1, linear, gradually narrowed to the obtuse apex, 9 to 10 mm. long; cotyledons very narrowly oblong-lanceolate, 5.5 mm. long, about 1.1 mm. wide, obtuse; radicle 2 mm. long.

Type locality.—Mirador, Vera Cruz, Mexico.

Distribution.—Vera Cruz, Mexico.

Specimens examined.—Vera Cruz: "Miradores," Jan., 1839, *J. Linden 30*, flowers, type collection (F, K, M-fragment). Vera Cruz, altitude 1000 m., June–Oct., 1840, *H. Galeotti 4320* (K). "Cabrestos," April, 1841, *F. M. Liebmann 4041* (US). Mirador, 1841–43, *Liebmann 14890* (F); Jan., 1842, *Liebmann 14891* (F); March, 1841–43, *Liebmann 14893* (F); March, 1842, *Liebmann 116c* (C, US). "Prés de Vera Cruz," 1857, *Sumichrast 490* (F-fragment). Fortin, March, 1883, *E. Kerber 360*, fruits (F-fragment, K, M-fragment, US). Zacuapán, March, 1907, *C. A. Purpus 2386*, flowers (C, F, G, M-fragment, Mo, NY, US); Feb., 1908, *Purpus 2836* (C); March, 1922, *Purpus 8752*, flowers and fruits (C, G, M-fragment, Mo, NY, US); March, 1927, *Purpus 11050* (F, US); Feb., 1931, *Purpus 14161*, flowers (M).

Vernacular name.—*Naranjillo* (*Kerber 360*).

2. Zinowiewia concinna Lundell, *Bull. Torrey Bot. Club*, 65: 470. 1938. (Pl. VIII.)

A small tree (Pringle) or large tree (Hinton). Leaves subcoriaceous or subchartaceous. Petioles 4 to 8 mm. long, canaliculate. Leaf blades ovate, elliptic-oblong, or lanceolate, 5.5 to 11 cm. long, 2.5 to 4.5 cm. wide, apex acuminate, the acumen obtusish or acute, base acute, decurrent, costa nearly plane above or slightly impressed, prominent beneath, openly reticulate-veined, the main lateral veins 6 to 8 on each side. Cymes subsessile or short pedunculate, 1.3 to 2.8 cm. long, forked 4 to 6 times, the primary branches usually much shortened, crowded. Pedicels 2 to 3.5 mm. long, slender, jointed at or near the middle. Calyx 5-lobed, the lobes about 0.5 mm. long, the margins bearing slender red deciduous teeth. Petals 5, broadly ovate or ovate-oblong, 1.3 to 1.7 mm. long, 1 to 1.2 mm. wide, apex rounded. Filaments about 0.6 mm. long. Anthers about 0.4 mm. long.

Disk pentagonal. Ovary submerged in disk; ovules small, about 0.25 mm. long. Fruits subfalcate, oblong-elliptic, 2 to 2.2 cm. long, 6.5 to 8 mm. wide, acutish or obtusish, apiculate, venation faint; seed linear-oblong, 8 to 10 mm. long; cotyledons linear-lanceolate, about 5.5 mm. long, obtuse; radicle about 2.7 mm. long, slender.

Type locality.—Sierra de Tepoxtlán, near Cuernavaca, Morelos, Mexico.

Distribution.—Morelos, Michoacán, and state of Mexico, Mexico.

Specimens examined.—Morelos: Sierra de Tepoxtlán, Feb. 8, 1899, *C. G. Pringle 8024*, fruits (A, C, F, G, M, Mo, P, US); Sept. 11, 1900, *Pringle 8438*, flowers, type (M), type collection (A, C, F, G, M, Mo, NY, P, US); Nov. 20, 1902, *Pringle 9706* (F, G, NY, Mo, US-2). Michoacán: Santa María, Oct., 1909, *Arsene* (F). State of Mexico: Distrito de Temascaltepec, Mina de Agua, altitude 1990 m., Oct. 31, 1932, *G. B. Hinton 2332*, flowers (K, US); Feb. 4, 1933, *Hinton 3253*, fruits (K).

Vernacular name.—*Gloria* (*Hinton*).

Economic value.—Used in necessity for fodder (*Hinton*).

The faintly-veined acutish wing of its oblong-elliptic samaras, the long pedicels, and the obtusish or acute acumen of the leaves distinguish *Z. concinna* from *Z. integerrima* to which it is closely related (compare Pls. VII and VIII). *Z. integerrima* has broadly oblanceolate or obovate rounded more strongly veined samaras, much larger cymes, shorter pedicels, and bluntly obtuse subacuminate leaves.

3. Zinowiewia pallida Lundell, *Bull. Torrey Bot. Club*, 65: 473. 1938.

A tree 10 m. high and 10 cm. in diameter, with short trunk; branchlets slender, red at first, whitened in age. Leaves pallid, subcoriaceous. Petioles reddish, 3 to 5 mm. long, slightly canaliculate. Leaf blades oblanceolate, rarely oblanceolate-elliptic, 4 to 9.5 cm. long, 1.4 to 3.3 cm. wide, apex obtuse or rarely rounded, minutely apiculate, base acuminate, slightly decurrent, discolorous, the young leaves whitish beneath, costa elevated above on lower half of blade, pinkish and very prominent beneath the

entire length, main lateral veins 5 to 8 on each side, inconspicuous above, prominulous beneath, anastomosing near the margin. Cymes 2 to 2.8 cm. long, pedunculate, forked 4 or 5 times, open. Flowers small, pale green. Pedicel of terminal flower in cymules 1.2 mm. long, jointed at base; pedicels of lateral flowers in ultimate cymules about 2 mm. long, jointed at middle. Calyx 5-lobed, the lobes about 0.4 mm. long, rounded. Petals 5, broadly ovate, 1.2 to 1.3 mm. long, about 1 mm. wide. Filaments about 0.5 mm. long. Anthers about 0.3 mm. long. Disk thick, pentagonal, margin nearly plane. Ovary submerged in disk. Young immature fruits samaroid, typical of genus.

Type locality.—Río On, Mountain Pine Ridge, El Cayo District, British Honduras.

Illustration.—*Bull. Torrey Bot. Club*, 65: 474. 1938.

Distribution.—Known only from southern British Honduras.

Specimens examined.—BRITISH HONDURAS: El Cayo District, Mountain Pine Ridge, in open granite bed of Río On, Aug. 5, 1936, *C. L. Lundell 6794*, flowers, type (M), type collection (M-2). Stann Creek District, Silk Grass Creek Reserve road, in broken ridge, Sept. 9, 1938, *Percy H. Gentle 2641*, flowers (M).

4. ZINOWIEWIA COSTARICENSIS Lundell, *Bull. Torrey Bot. Club*, 65: 471. 1938.

A tree; branchlets slender. Leaves chartaceous, discolorous. Petioles slender, 4 to 9 mm. long, shallowly canaliculate. Leaf blades lanceolate, 3.5 to 8.5 cm. long, 1.3 to 2.8 cm. wide, apex and base acuminate, decurrent, much paler beneath, costa slightly raised above, prominent beneath, the main lateral veins 4 to 6 on each side. Cymes small, usually about 1.5 cm. long, forked 3 or 4 times. Calyx 5-lobed, the lobes rounded, about 0.5 mm. long. Petals 5, broadly ovate to suborbicular, 1.1 to 1.3 mm. long, 1 to 1.1 mm. wide, rounded at apex, inconspicuously erose. Margin of disk raised. Fruits oblanceolate, 1.5 to 2.1 cm. long, 5 to 6.5 mm. wide, subfalcate (1-seeded) or straight (2-seeded), venation of wing strongly ascending, faint, scarcely discernible near the margin, apex emarginate; 1-celled and 1-seeded, or 2-celled and 2-seeded, the seed erect, linear-oblong in outline, terete, 6 to 8 mm. long, apex rounded; cotyledons linear-lanceo-

late, rounded at apex, 5.2 mm. long, about 1.2 mm. wide; radicle 2.3 mm. long.

Type locality.—Cuesta de Tarrazu, Costa Rica.

Distribution.—Costa Rica, and possibly Panama.

Specimens examined.—Costa Rica: Cuesta de Tarrazu, altitude 1900 m., April, 1893, *Tonduz 7861*, flowers and fruits, type (US-No. 471,825), type collection (M). Monte Candelaria, Feb., 1847, *Oersted 116K*, sterile (F-fragment, M-fragment, US). Panama: Vicinity of El Boquete, Chiriquí, altitude 1000 to 1300 m., March 2–8, 1911, *W. R. Maxon 5109*, flowers and young fruits (F, M).

The Panama specimens, referred tentatively to *A. costaricensis*, have leaves ovate or ovate-lanceolate, cymes as much as 3 cm. long, and petals slightly larger (about 0.2 mm. longer and proportionately wider). Young fruits are typically emarginate, but slightly broader; all of those available are 1-seeded.

5. Zinowiewia australis Lundell, *Bull. Torrey Bot. Club*, 65: 469. 1938. (Pl. IX.)

A tree about 20 m. high; branchlets slender. Leaves subchartaceous, dark green. Petioles slender, deeply canaliculate, 6 to 8 mm. long. Leaf blades ovate-elliptic, lanceolate, or elliptic, 5 to 8 cm. long, 2.3 to 3.7 cm. wide, apex acuminate, the acumen acutish, base abruptly narrowed, acute, decurrent, costa slightly elevated above at base, prominent beneath, reticulate-veined, the main lateral veins 4 to 6, margin revolute. Cymes subsessile, forked 4 or 5 times, the primary branches much shortened. Fruits broadly oblanceolate to obovate, 2 to 2.4 cm. long, 7.5 to 9.5 mm. wide, strongly veined, the veins nearly horizontal above the middle, veinlets well developed from margin of wing, apex rounded, apiculate; 1-seeded, the seed 9 to 11 mm. long, 2.5 to 3 mm. in diameter, subterete, nearly straight, the ends narrowed, rounded; cotyledons lanceolate, 6.8 to 7.5 mm. long, 2 to 2.1 mm. wide, rounded at apex; radicle linear, quadrangulate, 3 mm. long.

Type locality.—"Selvas nubladas, Agua y El Junquito," Venezuela.

Distribution.—Known only from the type collection.

Specimens examined.—Venezuela: "Selvas nubladas, Agua y

El Junquito," altitude 1800 m., Dec. 29, 1936, *H. Pittier 13826*, fruits, type (F-No. 894,843, M-fragment).

Vernacular name.—*Canalete* (*Pittier*).

6. Zinowiewia Matudai Lundell, *Bull. Torrey Bot. Club*, 65: 472. 1938.

A tree 7 to 9 m. high, 15 cm. in diameter; branchlets slender, drying reddish black, striate, slightly compressed at nodes. Leaves chartaceous at first, subcoriaceous with age, drying yellow-green, somewhat paler beneath. Petioles slender, 7 to 11 mm. long, canaliculate, reddish. Leaf blades narrowly oblong, oblong-elliptic, or oblanceolate, 5 to 9 cm. long, 2 to 3.5 cm. wide, apex acuminate, the acumen obtusish or acute, base subacuminate, distinctly callosed and revolute on each side, costa prominent beneath, slightly impressed above, openly reticulate-veined beneath, main lateral veins 6 to 8 on each side, prominulous beneath, inconspicuous above, arcuately ascending, anastomosing into a submarginal vein. Cymes 1.4 to 2.4 cm. long, pedunculate, forked 3 to 5 times, the branches short, crowding the flowers. Flowers purplish (Matuda). Pedicels very short, usually less than 0.5 mm. long, jointed at or near the middle. Calyx 5-lobed, the lobes broadly ovate, about 0.5 mm. long, obtusish or rounded. Petals 5, ovate, 1.6 to 2 mm. long, 1 to 1.2 mm. wide, obtusish or rounded. Filaments subulate, about 0.7 mm. long. Anthers about 0.25 mm. long. Disk thick, pentagonal. Ovary almost entirely submerged in disk. Style slender, equaling filaments in length. Samaras oblong-elliptic, 12 to 15 mm. long, 4 to 5 mm. wide, subfalcate, the wing decurrent to base on side opposite seed, lateral veins above middle of wing nearly horizontal, faint, veinlets undeveloped from margins, apex obtuse or bluntly obtuse, apiculate; 1-celled, 1-seeded, the seed erect, lanceolate-oblong in outline, 4.5 to 5 mm. long, nearly terete, reddish; cotyledons linear-lanceolate, about 3 mm. long, obtuse; radicle 1.2 to 1.4 mm. long.

Type locality.—Buena Vista, Escuintla, Chiapas, Mexico.

Distribution.—Known only from Escuintla and Mt. Ovando, Chiapas, Mexico.

Specimens examined.—Chiapas: Buena Vista, Escuintla, Jan.,

1938, *Eizi Matuda 1872*, flowers and fruits, type (M), type collection (M-4). Mt. Ovando, near Escuintla, Dec. 17, 1936, *Matuda 424*, flowers and fruits (M-2).

7. ZINOWIEWIA RUBRA Lundell, *Bull. Torrey Bot. Club*, 65: 475. 1938. (Pl. X.)

A large tree; branchlets dark red, rather stout, internodes short or elongated. Leaves subchartaceous or subcoriaceous. Petioles 3.5 to 11 mm. long, reddish. Leaf blades lanceolate or lanceolate-elliptic, 4 to 11 cm. long, 1.5 to 3.5 cm. wide, apex usually acuminate, sometimes subacuminate, the acumen acute or obtusish, base acuminate or acute, decurrent, costa narrow above, pinkish and prominent beneath, openly reticulate-veined, the main lateral veins 5 to 8 on each side. Cymes 2 cm. long or less, short pedunculate or subsessile, the peduncles and branches stout, forked 2 to 4 times. Flowers crowded, maroon or tinged maroon. Pedicel of terminal flower in cymules about 1.2 mm. long, jointed at or above the middle; pedicels of all lateral flowers jointed above the middle. Calyx 5-lobed, the lobes broadly triangular-ovate, about 0.5 mm. long, obtuse. Petals 5, ovate, 2 to 2.2 mm. long, about 1.5 mm. wide, apex rounded. Filaments subulate, about 0.75 mm. long. Anthers minute, about 0.2 mm. long. Disk green, pentagonal. Ovary submerged in disk. Immature fruits oblong-elliptic, dull red (*Skutch 1680*), 1-seeded, obtusish.

Type locality.—Tecpam, Department of Chimaltenango, Guatemala.

Distribution.—Highlands of Guatemala.

Specimens examined.—GUATEMALA: Department of Chimaltenango, Tecpam, altitude 2800 m., Oct. 14, 1933, *A. F. Skutch 639*, flowers, type (M), type collection (D, NY, US). Department of Quiché, Nebaj, a tree to 30 m. high and 90 cm. in diameter, flowers green tinged with maroon, fruits dull red, in remnant of cloud forest, altitude 2550 m., Nov. 16, 1934, *Skutch 1680*, flowers and young fruits (F, M-fragment).

Z. rubra, the largest tree in the genus, is noteworthy for its large maroon or maroon-tinged petals, 2 to 2.2 mm. long, and 1.5 mm. wide. It is closely related to *Z. Matudai*, but differs in its longer pedicels, larger flowers, green rather than yellow-green leaves, and the absence of the callosed revolute base of the leaf blades.

PLATES I–X

FIG. 1. *Wimmeria lanceolata* Rose. Type specimen, *Rose, Painter, and Rose 9287*, in U. S. National Herbarium. Approximately 2/3 natural size.

FIG. 2. *Wimmeria Bartlettii* Lundell. Type collection of fruits, *Bartlett 12773*, in New York Botanical Garden Herbarium. Approximately 7/8 natural size.

Wimmeria microphylla Radlk. *Pringle 6688*, in Gray Herbarium. Approximately 7/8 natural size.

Wimmeria pubescens Radlk. *Purpus 2020*, in Missouri Botanical Garden Herbarium. Approximately 7/8 natural size.

Wimmeria obtusifolia Standl. Type specimen, *Gaumer 24259*, in Herbarium of the Field Museum of Natural History. Approximately 7/8 natural size.

Microtropis guatemalensis Sprague. Type collection, *Heyde and Lux* (*Donnell Smith 3088*), in U. S. National Herbarium. Approximately 7/8 natural size.

Microtropis Schiedeana Loes. Type collection, *Schiede*, in Kew Herbarium. Approximately 7/8 natural size.

Zinowiewia integerrima (Turcz.) Turcz. *Purpus 2836*, in Herbarium of the University of California. Approximately 7/8 natural size.

Zinowiewia concinna Lundell. *Pringle 8024*, in Herbarium of the Field Museum of Natural History. Approximately 7/8 natural size.

Zinowiewia australis Lundell. Type specimen, *Pittier 13826*, in Herbarium of the Field Museum of Natural History. Approximately 3/4 natural size.

Zinowiewia rubra Lundell. Type specimen, *Skutch 639*, in Herbarium of the University of Michigan. Approximately 8/9 natural size.

CONTRIBUTIONS FROM THE UNIVERSITY OF MICHIGAN HERBARIUM

No. 1. Rusts from British Honduras, by Edwin B. Mains.
Notes on Agarics from British Honduras, by Alexander H. Smith. 28 pp., 2 pls. Price, $.25. (Issued May 23, 1939.)

No. 2. Studies in the Genus *Cortinarius*. I, by Alexander H. Smith. 42 pp., 12 pls. Price, $.35. (Issued June 30, 1939.)

No. 3. Revision of the American Celastraceae I. Wimmeria, Microtropis, and Zinowiewia, by Cyrus Longworth Lundell. 46 pp., 10 pls. Price, $.40.